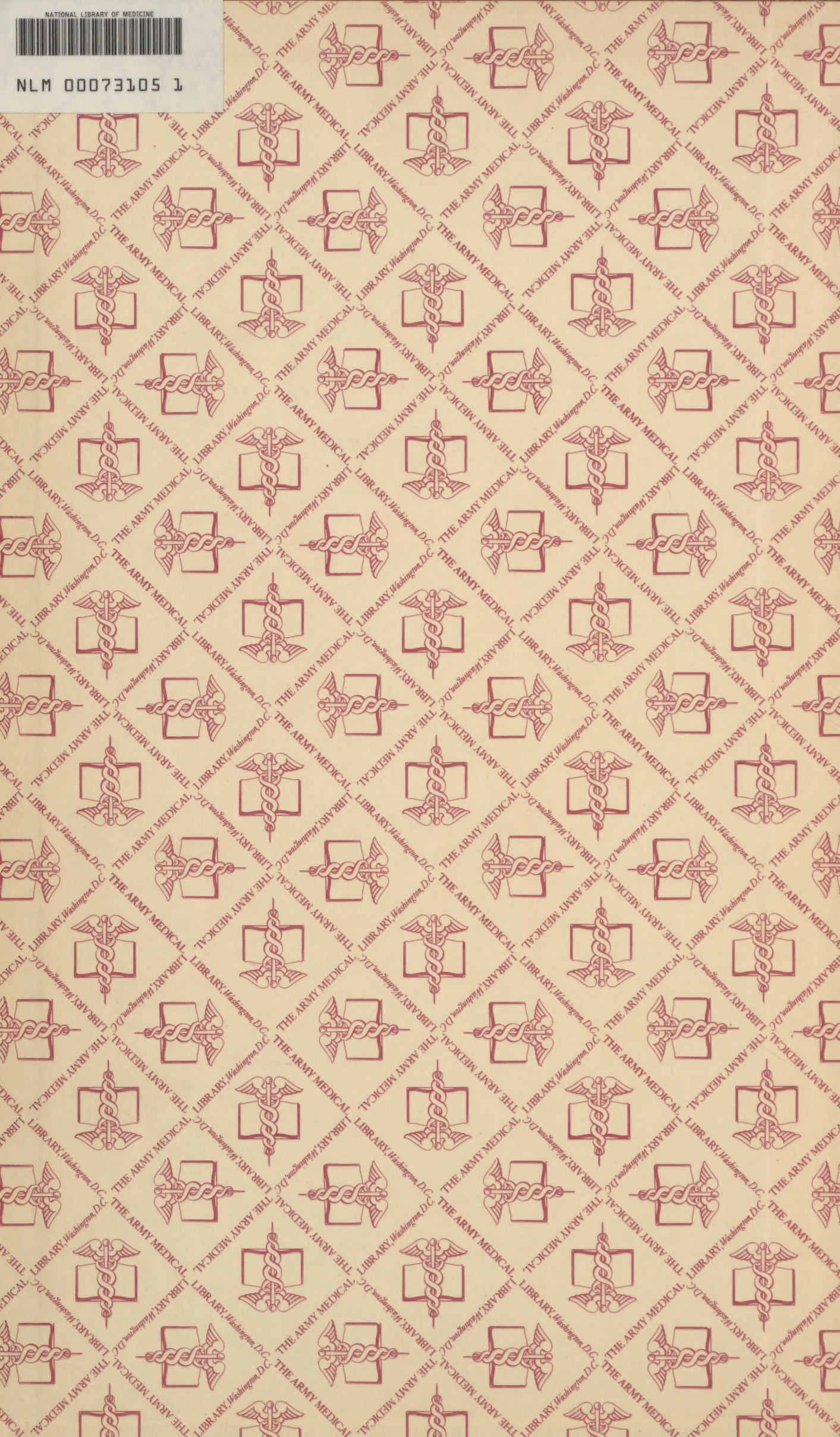








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Germany (Territory under Allied Occupation, 1945-  
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OFFICE OF MILITARY GOVERNMENT FOR GERMANY (U.S.)  
OFFICE OF NAVAL ADVISOR  
Medical Section  
Room 124, EUCOM HDQTRS.  
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Project Folios

FOREWORD TO THE TRANSLATION OF THE REPORT OF THE  
THIRD CONFERENCE OF THE MEDICAL CONSULTANTS TO  
THE GERMAN ARMED FORCES.

In this report of the Third Conference of the Medical Consultants to the German Armed Forces we find a cross-section of the problems confronting them in the late spring of 1943. At this time almost all of continental Europe was occupied and the war was still going along more or less satisfactorily in Russia and in North Africa.

There was some concern over public health problems within the Army itself (tuberculosis) and within the occupied countries as regards typhus and other endemic and epidemic diseases.

This portion of the translation project, when combined with the report of the Fourth Conference and the Classification of Fitness, published previously, give a broad view of the changing aspect of the medical and manpower problems. It appears to be a reasonable assumption that the opinions expressed are the best information available in Germany at that time concerning the particular subjects.

HARRY J. ALVIS,  
Commander, Medical Corps,  
U. S. Navy.

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INDEX FOR  
R E P O R T  
OF THE  
THIRD CONFERENCE OF SPECIAL MEDICAL CONSULTANTS  
FROM 24th TO 26th MAY 1943  
AT THE MILITARY MEDICAL ACADEMY, BERLIN

\* \* \*

Translation prepared by:  
Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section



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# I

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R E P O R T  
OF THE  
THIRD CONFERENCE OF SPECIAL MEDICAL CONSULTANTS  
FROM 24th TO 26th MAY 1943  
AT THE MILITARY MEDICAL ACADEMY, BERLIN

\* \* \*

Translation prepared by:  
Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section

## PREFACE TO THE REPORT

The third conference of the medical consultants held from the 24th to 26th May 1943 at the Military Medical Academy in Berlin, brought together, as did the previous one in November 1942, the leading medical officers, consulting physicians and specialists of all parts of the Armed Forces, the Wehrmacht and the organizations and units commanded by the Armed Forces and affiliated with it. The scope of the meeting was enlarged by the participation of the otorhinolaryngologists and oculists.

Once again vital army medical questions were discussed with special consideration of the peculiar requirements of the various Armed Forces units. The important principles for the issuing of orders were established and by this means a scientific foundation has been created for future orders to all responsible offices of the medical service. If above all, questions of delayed and subsequent treatment were given first consideration during this conference, it was because of experience gained during 4 years of war, available for the physicians in general through scientific discussions.

In the field of surgery special attention should be given to the discussion of the results of reamputation and stump treatment, mobilization of the joints and the return to duty of those disabled by effects of cold. The present experience with the use of sulfonamides for the treatment of wounds was summarized in a set of directions for their use compiled cooperatively by surgeons, pharmacologists and pathologists.

The possibility of return to service and the treatment of ulcer and diphtheria patients, post-dysenteric gastro-intestinal disorders, as well as volhynia fever, which is important for the Eastern campaign, was discussed by the internists.

The hygienists gave directions for the protective immunization for diphtheria and scarlet fever and reported among other things on the experiences made with tetravaccines important for a simplification of vaccinations against typhoid fever, paratyphus A and B, and cholera.

The eye and ear specialists selected for the initial deliberations in their speciality those questions which most needed clarification. The eye specialists prepared general directions for the treatment of eye casualties with special consideration of injuries to the eye by foreign bodies and for the question of transportation. The ear specialists, among other things, prepared directions for the treatment of gunshot wounds of the larynx.

It is not possible to mention here all the various subjects discussed, all of which are of the same importance for army medicine. The following report affords ample evidence of the wide scope of the work done and the earnestness with which research work has been carried out in all branches of the Armed Forces medical services.



The printing of this report had to be limited this time too. For this reason I ask everyone to make certain that the existing copies find as wide a distribution as possible, in order to bring the experiences stated therein to a general profitable usage. To each consulting physician, one copy of the report will be handed over for his personal use.

/s/ Dr. HANDLOSER

S p e e c h

of the Chief of the Armed Forces Medical Service.

Gentlemen!

The war time conferences of the consulting physicians, which should give the opportunity for scientific discussions of treatment and all urgent scientific questions resulting from the war and which should form the scientific bases for medical service directions, have become a permanent institution. If one looks back at the meeting in January 1940 and the two conferences in May and December 1942, and views their results critically, it is possible even now to consider this venture as completely successful in every respect. The meetings were beneficial to the welfare of our hard-fighting German soldiers, the wounded as well as the sick ones, and also for the benefit of the health service of the entire Armed Forces. In addition to this they also stimulated scientific research and increased the mental equipment of the German physicians serving in the Armed Forces.

Since the last time we came together at this place and in this circle for the second conference in December of last year, events of great military importance have overtaken us. Fighting in the East has become so fierce again during this last winter that it required the utmost effort of all the forces at the front and in the home country. Side by side with the fighting men stood our medical officers, non-commissioned officers and men of the medical corps in Stalingrad and Africa, to the last and they shared heroically in a soldierly bearing in the performance of their medical duties as in the fate of their troops. These comrades will always be sure of our gratitude and of the gratitude of the whole German nation. The medical service has been and will also be in future faced with important parts of the operations, regarding the situation of personnel and material which can be performed only by a centralized and well-planned direction. There are no more pressing special tasks and special problems than the improvement of this central supervision everywhere. This is the order of the hour and the future.

For the first time in this circle we have with us today the two consultant groups of the otorhinolaryngologists and the oculists. There is no denying the importance of these special fields. The increasing ferocity of the war as well as the large number of wounded needing special treatment and care by these two branches immediately after combat and also during the after-treatment, makes close cooperations with them absolutely necessary.

I welcome you all most cordially and at the same time I express the wish and request that you should put at our disposal again, during this meeting, your great practical and medical scientific experience acquired in time of peace and enlarged during the war, so that we may be able to decide the most urgent questions and may further the solution of them.



I especially welcome the General Commissioner of the Fuehrer for the medical and health service, General (MC.) Prof. Dr. BRANDT. He is the advocate of our interests with the Fuehrer. We wish him the best success for his tasks and his work and know that our common cause and our common aims are in the best hands with him.

I also welcome the Reichs Commissioner of Health, State Secretary Dr. CONTI. Through his work in the civilian sector he is creating the basis for the preservation of the health of the home country and by this of the health of the rising generation fit for service under the flag. Many common cares unite us, and we are endeavoring to overcome them by combined efforts.

I would like to direct your attention to the fact that this third meeting was not arranged casually but that it was arranged after the leading advisors declared it to be important and necessary for the conduct of the war and was not to be postponed. The value of these meeting consists, as it always has, in affording a large number of specialists the opportunity to carry through joint negotiations and to decide on important policies.

Let me give you a brief outline of the purpose of today's meeting. Let me give you first a survey of the problems and aims of the last conference. At that time we had another winter in the East before us. It was necessary to arrive at a policy for the treatment of injuries by cold which had to be expected according to the special character of the Eastern climate. War experience teaches us that they may be lessened by appropriate and carefully introduced preventive measures but can never be averted entirely. The surgery of war needs new directions for the treatment of the most important gunshot injuries. As in every field of medicine, here also, the methods and points of view are changing rapidly. Our aim is to advance the good things, for in the medical field war always has been the great teacher. Lectures have dealt with gunshot injuries of the abdomen, lungs and jaw; fractures by gunshots of the upper part of the thigh, injuries of the joints, transportation problems and in connection with this the transportation bandages; shock and collapse as especially important for the winter campaign were also discussed.

In collaboration with the hygienists, the consultants in internal medicine put on their program spotted fever and dysentery as the most threatening epidemics of the East, and in addition typhoid fever, against which our immunization procedure has given good protection. Furthermore, paratyphoid has been discussed.

Besides these there have been discussions of wound diphtheria, diphtheria of the upper larynx and scarlet fever and finally, but not last, hepatitis epidemica and war nephritis. These last two diseases give us special problems to solve. They are also vital problems of the moment. It is the merit of Lt. Col. (MC.) Prof. GUTZEIT that he furthered successfully research work in the field



of the etiology of hepatitis epidemica. The hygienists have prepared directions, based on their special experiences, to which was added as an important document, the Atlas of Epidemiology by ZEISS. A new series of charts of this atlas deals, among other diseases, with paratyphoid A in Europe, with the distribution of the various mosquitos important for us, leishmaniasis, as well as leprosy in the South East. The next series of charts will deal with the Northern part of the Mediterranean. Let me conclude with the enumeration of the special fields represented at the last meeting: you will find all the details in the report which you will receive through your office one of these days.

We regret to announce this time too the death of comrades from the circle of the consulting specialists, gone from our midst since the last conference. On 22 December 1942 Lt. Col. (MC.) Airforce, Prof. Dr. MAGNUS died. Only shortly before he had attended our last meeting.

On 19 December 1942 Oberstabsarzt (Major, MC.) Prof. Dr. WUELLENWEBER died, consulting internist for Wehrkreis (Army District) VI and on 10 May 1943 Oberstabsarzt (Major, MC.) Dr. GABE, consulting tuberculosis specialist for Wehrkreis (Army District) XII left us. Dr. GABE fell a victim to the disease, the fighting of which was the task of his life. Men of high merit in war and peace, who have all these years been valuable advisors to the medical service thus have left us. We remember them as models of the most faithful performance of duty, together with those of many German medical officers of all ranks who during this war gave their lives in their profession for the liberty of the Reich.

I ask you to rise from your seats in honor of these comrades.

During the present meeting not only questions of prevention and first aid shall be the subject of discussions but also in the fields of surgery and restorative surgery. In the other fields late treatment will be discussed. For the present, questions of delayed treatment to be especially discussed are: reamputation and stump treatment, mobilization of the joints, exercise treatment and sport for the wounded.

During the last year a large scale use of sulfonamides against gas gangrene was carried through on all fronts. As was to be expected opinions about their general use and their value vary. I hope that during this meeting a further clarification of opinions may be reached by the discussion on sulfonamides.

The ophthalmological specialists will deal with important questions concerning injuries to the eyes. Prof. DIETER has developed a giant magnet for use in the field which is considered everywhere as a welcome advance. Protective glasses for protection against fragments have also been constructed by him and a magnetic extraction device for the removal of splinters and bullets. You will have the opportunity to inspect these devices during this meeting.



A special section has been devoted to vaccination serums in cooperation with different specialist branches. In the meantime protective immunization against diphtheria has been introduced. We have now to wait for the results. Our vaccination serums against typhoid, paratyphoid and spotted fever have been successful in every respect. Our aim must be to decrease the number of injections. Tests made in this connection with a tetravaccine, which besides typhoid and paratyphoid A and B shall also protect against cholera, have been successful.

In discussing our working program I only choose a few points; others are not less important; when our directions will be announced on the 3rd day everyone will receive information about them.

I still want to say something about the general tasks of the consulting specialists. Their active service and their work have proven excellent. The longer the war lasts the more important the work of the consulting physicians becomes, especially as regards the education and training of our young physicians. Whenever and wherever it is possible medical training must be carried out and the advisors have to be the mental center of medical scientific teaching in all army districts and in the occupied zones as well as in the home country.

I want to thank you today, gentlemen, with all my heart for the faithful and hard work you are doing in these difficult times. We have to perform a medical mission and sustain a medical tradition. The work thus done for the Fuehrer and the nation can await the judgement of history without any presumption. The success achieved during four long years of war speaks for itself when objectively and fairly judged. There never was nor will be any such phrases as "too much" among physicians and there shall now be no rest in the efforts for further perfection.

Our third conference which I open herewith and to which I wish complete success, shall also be guided by these principles.

I.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON OPHTHALMOLOGY

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Translation prepared by:

Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section



1. Primary treatment of injuries of the eyeball.

Stabsarzt (Captain, MC.) Prof. HANS KARL MUELLER

The establishment of large eye departments in the field has proven excellent. The distribution of work among the ophthalmologists, the nurses and the medical corpsmen, as well as the use of devices for the examination of the eye and the surgical instruments, may be made in such a way that the care for the wounded, even for large numbers of them, may run smoothly.

The fate of injured eyes depends largely on the following factors:

1. Amount of damage to the eye caused by the injury;
2. Size and density of the hemorrhage within the eye;
3. Kind and extent of the inflammation within the eye;
4. Kind and nature of scar formation in the eye;
5. Date of starting as well as suitable choice and execution of the treatment.

In order to avoid secondary hemorrhage the putting at rest of the eyes (high-percentage atropin ointment, long bandaging of both eyes, bed rest with administration of sedatives (luminal) and analgesics, light diet) intravenous injections of Clauden, Calcium and Redoxon are necessary. The absorption of the hemorrhage may be furthered by potassium iodide, heat, diaphoresis, dionin, puncture of the anterior chamber and injections of saline. The infection of wounds can be fought with 25 per cent marfanil-prontalbin salve, pyrifur and by large doses of sulfonamides, as well as by atophanyl and cycloctropin. The wounded must not be moved too early.

For the treatment of injuries to the lid, even when the wounds were soiled, early covering of the defects by curved plastics of IMRE or by the methods of BUROW and KNAPP, has been successful.

Only if the purulent discharge into the wound area is to be expected from a sinus or the nasal cavity itself should early plastic closure not be used. In certain cases a covering of injuries to the tunica conjunctiva after removal of an eye can be made successfully with conjunctiva tunica from corpses.

If large parts of the cornea are missing, injuries to the cornea have a very bad prognosis. Corneal suture and conjunctiva tunica covering are often not able to prevent the loss of an eye. In these cases only the replacement of the lost tissue by cornea removed from corpses may improve the chances of a cure. A total keratoplasty was made four times. In two of these cases the eyes were in relatively good condition after 4 months. On several occasions the corneal defect was closed by partial keratoplasty and in some cases a closing of the wound was accomplished by this.



Injuries of the corium can be closed by operation, only if the situation within the eye is clear regarding diagnostic and therapeutic conditions. One must be sure, whether the injury to the corium was caused by an intra-ocular particle, a shot through the eyeball, a ricochetting shot, a grazing shot, an injury similar to a cut, or by a blunt force. One will always decide upon closing the corium wound only if one is convinced that by this, the danger of infection is lessened, the density of the aqueous humor is restored quickly and scar formation will be influenced favorably.

The success of corium suture depends largely on the surgical technique. The principle of the technique must be to expose the corium wound widely and to close it accurately, preserving as much as possible of the eyeball. This principle can only be realized with corium wounds of the rear bulbus section by bending back the lids to the sides, by canthotomy and incisions into the orbital rim. Before removing prolapsed parts of the inside of the eyes it is favorable to use Glaucozan in order to avoid renewed hemorrhages. One should also be sparing with the removal of prolapsed tissue in order to avoid unnecessary shrinking processes. If, however, the prolapsed tissue is already purulently infected it is better to remove too much than too little. One should not open up very large corium wounds to their whole extent, but should close them gradually to avoid a renewed prolapse of parts of the inside of the eye. If possible one encloses the corium wound with a ring of diathermy coagulations to widen the scar in the choroid and in the retina. Well proven in this connection is the case of electrolysis instruments of SZILY and MACHEMER, which is very handy and only requires an anode battery as a source of current.

If the eyeball is shot through one should take care first of the wound where the bullet entered and afterwards of the one where it left. The size of the former and the size of the particle in the X-ray picture, as well as the seriousness of the injury within the eye give indications concerning the necessity of operating the wound at the site of exit. One has to consider that the wound of exit is always larger than the wound of entry. The corium suture for shots grazing the eyeball is of greatest importance, because these are often accompanied by large injuries of the corium, but without any serious injury to the inside of the eye. If it is a question of preserving the only remaining eye one will undertake a suture of the corium even with very large wounds.

For the treatment of eye casualties by the non-specialist, attention should be paid to the directions given to the advanced medical establishments in appendix 2 (H. Dv.) Army Manual 1 a on page 105 and 106. It is stated there with perfect justification that all serious and doubtful injuries to the eyes should be handed over to the specialist if possible within 12 hours at the latest. On many sections of the Eastern front, however, this cannot be achieved. It is therefore proposed, if a large number of wounded are to be expected, to employ groups of ophthalmologists, similar to those of surgeon groups, near the front, consisting of an ophthalmologist, a nurse and a medical corpsman. The equipment of this group should contain a specialist's case of



instruments and the giant field magnet of DIETER. The best way of securing their services is through the army group from a medical institution which has at its disposal X-ray equipment and personnel to reinforce the ophthalmologist group.

Experience also showed that frequently the operative treatment of the eyes by non-specialists does not improve the chances of a cure but rather diminishes them. It is therefore proposed to supplement the directions for treatment in this way that the non-specialist should generally abstain from surgical operations on the eye, if it is probable that the treatment may be taken over by a specialist within a period of 3 or 4 days. Until then the non-specialist has to maintain the quiet position of the inner and outer eye muscles through binocular bandage and atropin ointment and during the daily change of bandages to rub in disinfecting ointment as well as to administer large doses of sulfonamides.

The non-specialist should only carry out the surgical operations recommended in the directions for treatment if there is no chance of an eye specialist's taking the treatment over within 3 or 4 days. When this is the case the operations have to be performed as soon as possible. Shattered eyes should only be removed by the non-specialist if it is improbable that within the first 8 days after the injury an ophthalmologist can take over the treatment.

#### Discussion:

LOBECK: Army physicians should only bring the eyes to a resting position; no ointment should be applied if there are perforation injuries (layers of fat on the cornea make the examination more difficult; fat on the lids and in the conjunctiva increases the difficulties of an operation, ointment is not sterile). Early transfer to the eye department, even if the injury happened more than 48 hours before is urgently recommended. For after-treatment milk injections and albucid have been successful.

DIETER: Warns earnestly against dabbling surgical operations. No doubt the advice of KLEIBER has been the only "correct attitude", no trying to perform a surgical operation - to undertake an operation one has not mastered, cannot be condemned strongly enough. It is a crime committed against our wounded!

REICHLING: In my opinion the operative care of injured eyes, including the restoration of the lids, in the orbital area, and anucleation, has to remain in the hands of the well-trained eye surgeon exclusively and from the very beginning. This is advisable first, because for the decision to operate in cases presenting diagnostic problems only the eye surgeon is qualified to give an opinion based on strictly relevant findings; secondly, because perfect familiarity with the technique of eye operations is required. The cases in which operators, well-trained in other fields, for instance surgeons, also master the necessary experience and technique



for minor eye operations can naturally be only exceptional, for these, however, no positive instructions can be established. It is understood that through establishing directions, which forbid the care of injured eyes to non-specialists, in some cases damage may be caused even as great as the total loss of an eye by a delay of treatment. However, I do not believe that such damages as a whole, will even in the least equal the damage resulting from badly done operations by non-specialists. Everyone with experience knows of such examples. Directions will not accomplish the purpose. Much more profitable under certain circumstances will be a friendly discussion with surgeons of other special branches, especially on the occasion of training courses.

KAISER: The operative closing of corium injuries is possible even days afterwards with good functional result. The corium wound is in some cases closed temporarily by the chemotic conjunctiva, which can prevent infection of the eyes for the time being.

IVEN: During the winter 1941/42 several perforation injuries with large iris prolapses, even as old as 14 days, were seen. The eyes were completely free from irritation. The prolapses were merely removed with the cautery close to the rim of the cornea without opening the anterior chamber. This procedure was arrived at as the result of experience made in a similar case, where by pulling forward the iris, opening of the anterior chamber and covering of the conjunctiva tunica the only remaining eye was lost through an infection from the surrounding area. During a period of observation of 14 days the eyes remained free from irritation through parenteral treatment. The removal of the anterior synechia was put off until a later period.

HARMS: On principle one cannot prohibit a surgeon from operating on the eye, as unfavorable conditions may force him to do so. For these exceptional cases one has to give him strict instructions.

JESS: Warns against too great activity while trying to save injured eyes by extensive operations, of which, as known by general experience, one cannot expect that they will ever regain useful functions. The experience of the last war showed that very many of such skinking eyes finally had to be removed. Nevertheless it seems only fair to point out the danger of sympathetic ophthalmia which may occur in such cases.

HEINSIUS: 1. The experiences of H. K. MUELLER regarding treatment of lid injuries by early plastics are confirmed. The possibility of using THIERSCH's graft is pointed out. Sulfonamide treatment is only effective as long as it is continued, because the sulfonamides are eliminated comparatively soon.

2. As shown by experience many ophthalmologists lack sufficient surgical knowledge. It is therefore proposed if possible to designate the special branch departments of the field hospitals as surgical and non-surgical special departments.



3. The value of the direction for troop physicians and medical personnel given by the Navy have proven useful in cases where an early transportation to the eye hospital is possible. Bandaging of both eyes and transport in a reclining position seem important.

SCHMIDT: If no irritation exists the front medical units should abstain from the first care of perforation injuries (operative) when the circumstances are unsuitable. As shown by my own experiences of the winter 1941/42 it is advisable to connect the ophthalmological group with a centrally situated collecting station for wounded men, as there is also the opportunity for observation of all cases of eye injuries passing through before they are transported farther to the rear.

KLEIBER: Even simple eye operations, if urgent, may be made by a surgeon only if he is instructed accordingly. Especially in mobile warfare transportation is often so difficult and extensive that the initial surgical care of the eyes cannot be the final one. As far as could be seen experience with marfanil-ointment and marfanil powder was encouraging. Bandaging of both eyes is important for the transport of men whose eyes have been injured, also it is advisable to change the bandaging during a transport lasting several days.

DIETER: Plexiglas is well tolerated by the body and will heal in without reactions. Observations during September 1939 stimulated the use of plexiglas for plastic replacement of the bony orbital rims, lately also for closing off the orbit against the upper jaw cavity (periosteal sutures should be used for fixation of the inserted glass).

## 2. Wounds in the eye due to magnetic particles and their treatment.

Oberstabsarzt (Major, MC.) Prof. DIETER

Starting from the fact that every injury to the eye might cause loss of sight, the principle must be laid down:

The sooner the treatment of the presumably injured eye is started, the more favorable are the prospects, and the sooner can the danger be removed.

The first treatment should be the final one if possible.

The medical officer in the field cannot and need not ascertain the facts or even make a diagnosis. These tasks rest with the specialist only; he also is fully responsible for the measures to be taken.

He can perform a proper examination only with the appropriate instrumentarium. For this purpose there was developed a first-rate side illumination which will be exhibited in the form of a hand slit lamp of new design.

Ophthalmoscopy is indispensable and can be performed in cases of recent injuries even better than in such of advanced cloudiness of the refracting media (e.g. traumatic cataract. The value of the subjective methods of examination for a diagnosis of the whole case must not be underestimated.)

The X-ray picture (fluoroscöpy is not sufficient) is the most important method for finding a foreign body in the eye or its vicinity after ascertaining by preliminary examination, whether a perforation of the eye exists.

(Perforated, injured eyes containing foreign bodies inside or in the coats of the eyeball are more in danger than perforated, injured eyes containing no foreign bodies.)

The earlier a foreign body can be removed the better.

(In general, magnetic foreign bodies can be removed much more easily than non-magnetic material. Only an adroitly performed removal of the foreign body can preserve the eye and prevent all kinds of avoidable delayed damages.)

This involves further diagnostic and therapeutic obligations.

The exact localization of a foreign body is the most urgent task.

COMBERG's method is recommended for exclusive application as the best, the most reliable, and the most simple.

Every special department should have as standard equipment two COMBERG bowls with accessories and the medical depots of the army should be able to furnish spare parts.

(Supplementary methods for ascertaining the presence of invisible foreign bodies, like skeleton-free photos of the frontal section of the bulbus oculi, double photos of the moving eye and others, are used less in cases of war injuries than in peace times.)

Stereo-X-ray pictures are especially important for the so frequently occurring scattering of particles and for differentiation of one or several particles in the eyeball.

A distinction between magnetizable splinters and non-magnetizable ones is accomplished

1. through a test by magnet,
2. with aid of the sideroscope.

The examination by the magnetic needle answers at the same time the question, whether the foreign body itself can be removed by an electromagnet.

The great importance of these examination methods led to a new construction of highest sensitivity, the field-sideroscope, which will be demonstrated and proposed for adoption. The device is stable, transportable and can be employed at the front.



A magnetic particle, exactly located and ascertained in the inside of the eye, must then be extracted without delay. (This is to be done for confirming the indication for an operation and for fixing the time for its performance.)

The antibacteriological preparation of a presumably perforated, injured eye begins as a matter of principle with the first examination in order to make an operative treatment possible without loss of time.

The chief supposition for operative measures is the availability of an electromagnet. Generally, a very powerful giant magnet of highest efficiency is necessary. For that reason auxiliary giant magnets, some of which are quite efficient, were constructed during the first World War and also lately in the present one.

The often expressed and generally acknowledged demand led to another new construction which has been introduced as the field giant magnet. This device is independent of outside sources of current and other auxiliary installations (connection with electric battery). It is suspended in a way which permits the combination of a very powerful giant magnet with a hand magnet easy to handle and controllable power of traction so that injuries to the interior organs of the eye can be avoided.

Cutting instruments of non-magnetizable material can now be produced; they will be exhibited.

The extraction of magnetic foreign bodies from the frontal bulbus section is made in the usual manner. There are hardly any differences of opinion about the most gentle and therefore most suitable method. Extractions from the deepest layers of the cornea producing the danger of a draining of the aqueous humor of the eye, are carried out in miosis, as are many extractions from the anterior chamber and the frontal surface of the iris; otherwise when this is impractical in maximum mydriasis.

We prefer the supine posture during the performance of a magnet operation. The field giant magnet, however, can be used with every other posture of the body.

The extraction through the wound, under certain circumstances, therefore diascleral by penetration of the corium, is absolutely indicated in cases of fresh injuries with a wound still open to some extent, in other words within about 8 days. The ciliary region must be treated with the utmost consideration, especially if it should be necessary under any circumstances to enlarge the perforation wound.

The extra-ocular operation with the giant magnet, e.g. the drawing forward of the foreign body, particularly from the posterior section of the bulbus through the posterior chamber and pupil into the anterior chamber, and extraction from there, is in many cases of injuries by foreign bodies the most simple, the most gentle, and for that reason the method promising the best final results. Only if it is not



possible to remove the particle thus in a short time i.e. within a few days and after repeated attempts, there may be a justification or even necessity for a diascleral removal of the foreign body. After previous exact localization, it is approached directly by a meridional incision, if possible without insertion of the pole points into the vitreous body, or indirectly by making a meridional or flap incision through the outer layers of the sclera using Mendoza sutures before the sclera is completely severed, and putting the magnet on the edges of the wound, or in cases of extreme urgency and after all other possibilities have been exhausted by entering the inside of the eye nearest to the foreign body. This latter method is to be preferred if the particle can be kept under observation.

A newly designed hand-magnet is especially suited for many diascleral extractions, otherwise it is used for the extractions of particles lodged in the brain. To prevent detachment of the retina, in all cases of diascleral extractions, diathermic scarification is to be performed though it is not a certain protection against the occurrence of this very serious later development. Other objections to a more frequent use of diascleral extractions are hemorrhages, loss or cloudiness of the vitreous body, even though the arteriae ciliares longae, the region of the vortex veins etc. are protected and the incision is placed more often between ora serrata and aequator bulbi.

Small particles may frequently remain in the depth of the orbit, while larger ones are to be extracted, best from the front, as soon as possible. KROENLEIN's operation is rarely necessary. Secondary injuries are only avoided by early extractions.

#### Discussion:

LOEHLEIN: Mr. DIETER deserves our special gratitude for the construction of the new field giant magnet, which is now available in large numbers and delivered to the eye departments of the field hospitals. Many eyes will be saved through its use. DIETER's eye protector, made of artificial glass, also seems to be very useful in the protection against splinters from mines. Regarding iron splinters, I would like to call the attention of eye physicians in field- and home hospitals to the fact that very often two and even three magnetic particles are located in the same eye which means that the hospital providing the later treatments, has the duty in every case of particles lodged in the eye, even if already one or two particles have been extracted, to ascertain by careful X-ray examination and repeated trials with the giant magnet, whether a particle still remains in the eye. On the other hand, there are sometimes older cases in which iron particles are firmly embedded intraocularly and which have not yet caused siderosis and on which one would hesitate to make repeated attempts at extraction especially when the eye in question is the only one left and under certain circumstances, one may cause more harm by these attempts through destruction, e.g. destruction of the ciliary body, than one gains by them.



3. Wounds in the eye caused by non-magnetic particles and their treatment.

Professor JESS

Attempts to remove non-magnetic particles from the eye, when infection has already set in, are dangerous and in case of obscured observation are frequently unsuccessful. In cases of this kind, one should be content with the care of the wound and energetic general (sulfonamide) treatment and local antiseptics. In case of non-magnetic particles without infection of the eye, the composition of the particle should, if possible, be ascertained. For this purpose anamnesis, negative sideroscope findings and magnet tests, the appearance of the particle and the kind and density of the X-ray shadow, microscopic and chemical examination of similar particles from the vicinity of the eye and the conjunctiva, and the reaction of the tissue upon these particles may be of help. The behavior of fragments composed of copper, brass and bronze, lead aluminum and its alloys, stones, vegetable and tissue matter, glass, china and organic materials, of gunpowder and chemicals will be discussed in every detail especially with regard to their tolerance. Auxiliary means, such as the telephone tweezers by WEVE, which have not found favor, the metal finder by COMBERG and the LEYDHECKER forceps which have not been sufficiently tested yet, as well as the X-ray screen method, which seems to be very complicated, will be shown in pictures. The great difficulty experienced in operating on eyes with non-magnetic foreign bodies lodged in them justifies the demand that such cases should be sent only to specially equipped clinics which are in charge of highly skilled surgeons, and that in each case the chances of conservative treatment are to be considered carefully.

Discussion:

KYRIELEIS: The good toleration of Plexiglass in cases of injuries to the ocular conjunctiva and even the bulbus itself is pointed out. Therefore no attempts at a removal of such particles should be made, especially with inadequate means.

LOEHLEIN: We also have made the experience that many injuries caused by non-magnetic particles do heal in without complications. This applies especially to many alloys of copper which we dreaded largely for theoretical reasons. As the removal is frequently attended with a considerable amount of danger to the eye, we often tried to avoid it, particularly if the particle is healing in without reaction. As regards the method of my assistant TERTSCH, which consists in carrying out the extraction with simultaneous observations in two X-ray screens, I employed it successfully in some cases; it is, however, not simple, because the operator, on account of the strength of the X-rays, is obliged to act quickly which is often at variance with the situation.



#### 4. Wounds in the eyelids and tear ducts.

##### Professor CLAUSEN

The speaker pointed out first the serious disfiguration remaining frequently after injuries to the lids, the removal of which has to be made, not only for cosmetic reasons but because frequently the wearing of a prosthesis is made possible only by revision, or the visual power of a still intact eyeball may thus be protected against impairment.

The speaker underlined furthermore the importance of a primary care of the wound which must aim at preserving damaged tissue and restoring displaced tissue to its original position, where it must be fastened with some appropriate approximation sutures. Thus one may succeed sometimes in avoiding later plastic operations altogether. If this is impossible, a subsequent disfigurement may, under certain circumstances, be removed by simple plastic operations.

Then there followed a discussion in detail of those plastic operations which have proved successful in the removal of traumatic lid coloboma, lid scars adhering to bones with extropion, and for a total replacement of lower and upper lid, in which connection free flap plastics and plastics with pedunculated skin flaps were especially mentioned.

The replacement of the eyebrow arch by grafting on a pedunculated flap from the eyebrow of the other side is also briefly mentioned.

Finally a possible restoration of the canaliculus, as also the importance of a complete removal of remnants of the lacrimal sac which sometimes may cause a very disagreeable suppuration, was mentioned.

##### Discussion:

DIETER: Injuries of the lid urgently require the most considerate restorative care. Wire-plate sutures put fairly deep into sound parts (1½ to 2 centimeters) answered well, especially with adapted skin sutures put in between. Thus extensive plastics after operations are in most cases quite superfluous. (Demonstration).

#### 5. Transportation of eye casualties.

##### Oberstabsarzt (Major, MC.) KAISER

On account of their close relation in connection with the subject of "transportation of eye casualties" questions of transportation in general and the organization of the medical eye branch in the army must be dealt with. The fate of the injured eye depends in the first place upon a quickly performed operative closing of the wound, which is in this case of much greater importance than in case of injuries to any other organ. Therefore the operative treatment of the eye must begin with the least possible loss of time in a



hospital near the front whose eye department is adequately equipped with instruments, including a giant magnet, and which is in charge of a specialist well experienced in surgery. The treatment is to be accomplished best within the first 24 hours. The transport of eye casualties is also to be undertaken with the aid of the medical air service. The physician in the field has to bring the injured eye into a quiet position by means of a bandage over both eyes, if possible, and to state the urgency of transport on the accompanying paper. The advanced eye ward must be available to several divisions, it must be attached to an army field hospital and should be sufficiently large to take care of operated eye casualties on its premises until they are fit for transport. In case of being overcrowded with eye casualties the personnel can be reinforced by personnel reserves of the medical service of an army group or the army itself.

During September 1942, out of 100 eye injuries at the eye ward in Warsaw, 36 arrived from the front in the base hospital without having been taken care of previously. The medical care of eye casualties at the front has improved. The uncared for eye injuries reached the eye ward in Warsaw on an average of 7.7 days, the cared for eye cases on an average of 16.6 days: for 1/3 to 1/4 of the cases wartime surgical operations were still necessary. Of these operations, 56 consisted in the removal by surgery of those eyes which had become worse during the interval between the injury and the arrival at the base hospital. Eye casualties of April and May 1943 reached the first medical station for eye-injured on an average within 38 hours. Some of the eye wards of field hospitals are not yet sufficiently equipped with instruments.

Eye operations, especially a removal of eyes by surgery, are not to be performed by non-specialists, a removal of both eyes should never be undertaken by a non-specialist.

If eye injuries occur simultaneously with injuries to other parts of the body, the care of the eye injury has absolute precedence over all other injuries provided that they do not endanger life immediately. For better supply of more complicated spectacle glasses, field optician shops are to be attached to the larger wards in the war area. Skilled opticians are to be drafted and assigned to the medical army service, they are the best aid of the army ophthalmologist.

The introduction of a transport paper is proposed which shall be used in a similar way as the accompanying paper of the wounded, for the purpose of distinguishing wounded and sick and secure special care for them during transportation, on the way from the field hospital to the base hospital. Importance of hospitals attached to the base hospital. The extensive work, with regard to medical care of the eyes, could only be accomplished by establishing a larger eye department equipped with good instruments, especially with the giant magnet and by employing several eye specialists. 62 per cent of the ward patients and 78.5 per cent of the ambulatory new patients of all 4 eye wards of reserve hospital Group B could be treated by the eye department in Warsaw alone.



A larger eye department permits a saving of personnel and material in the area behind the front as well as in the sector of a base hospital and in the homeland and also yields greater practical success. In spite of this, for purposes of transport, the possibility of ambulatory medical eye examination in areas of larger troop concentrations must be taken into consideration.

In order to master this wide field with its many sided tasks the eye physician is to be entrusted exclusively with the medical care of the eyes.

#### Discussion:

IVEN: The employment of eye physicians in war hospitals is very frequently quite inadequate. As regards the employment of additional physicians to meet an unusually large increase of casualties the necessity for establishing special departments for eyes, throat, nose and ears is sometimes not sufficiently understood, as the specialists are employed in some other capacity. Particular consideration has to be given to the necessary care in war hospitals which is in most cases the first one by specialists, and not to questions of further transport.

#### 6. Wounds in the orbit.

Oberstabsarzt (Major, MC.) Prof. KYRIELEIS

Apart from the fact that the contents of the orbital cavity itself are very valuable, the importance of injuries of the orbital cavity is especially determined by the close local connections of the orbit with the accessory sinuses of the nose and the skull. Of the direct injuries to the orbital cavity the most important ones are those caused by small flat foreign bodies as well as injuries caused by stabs or by penetration of pointed objects. Both may, besides injuries of the bulbous, cause damage in the depth of the orbit itself (tearing off muscles and nerves, hemorrhage etc.). Besides this, there is the danger of a primary infection of the contents of the orbital cavity through soiled foreign bodies.

As a rule, small flat missiles and particles of missiles will destroy the eyeball itself or at least damage it more or less severely through contusion. If they penetrate farther through the orbital cavity there is the danger of accompanying injuries to the accessory sinuses, the cavity of the skull or of both. The opening of the accessory sinuses of the nose alone means danger of secondary infection of these never aseptic sinuses (orbital abscess and phlegmons). If accessory sinuses and the cavity of the skull are opened simultaneously, suppuration, developing in the orbita, may spread to the brain and its membranes. Thus an acute danger to life is created.



Injuries due to penetration of pointed objects and stab wounds need not necessarily damage the eyeball itself. The bulbus, imbedded elastically in the fat and soft parts of the orbital cavity can evade to a certain degree the less sudden penetration of the point. The danger of a primary infection of the contents of the orbital cavity is considerably greater, as the penetrating foreign body (stabbing weapons, points of wood or metal) is frequently not free from solid matter, as are practically the usually sterile, hot particles of shells or missiles of infantry weapons. The penetrating force of even comparatively blunt objects is often surprising. Under certain circumstances they may penetrate as far as the inside of the culvarium or the other orbital cavity. On the other hand change at the site of entrance may be surprisingly small, as the skin wounds and especially the wounds in the conjunctiva are able to close to a large extent, owing to the elasticity of the tissue, and very often lead to an entirely wrong conception of the caliber of the penetrating foreign body.

The orbital cavities may be affected indirectly by fractures of the skull base and the facial parts of the skull, especially in cases of injuries by gunshots.

If the line of fracture at the base affects the apex of the orbit, there is a possibility that in the course of several days, blood in the perimysium of the abducens may penetrate under the conjunctiva or through the loose orbital tissue in the subcutaneous connective tissue of the lids (late spectacle-shaped hematoma). If such a hematoma develops within a few hours after an injury to the skull by gunshot without showing any visible signs of force in the neighborhood of the eye itself, this is practically a sign that the roof of the orbital cavity has been split to a large extent by the explosive effect of the shot or by the counter shock (contrecoup). In this case it is almost certain that the ethmoid bone or the frontal sinus roof too has been broken and therefore an infection of the inside of the skull from the accessory sinuses is threatening. Prompt action by the surgeon will be necessary in most cases to avoid complications endangering life.

Fractures of the facial parts of the skull may lead to a breaking through of the orbital wall, especially of its bottom, from the outside, and as a result of this to a traumatic enophthalmos. If in such cases the eye itself is affected by the force, considerable shifting (luxation) of the bulbus may result, which in some cases was even found in its entirety, preserved in its shape, in the maxillary sinus during autopsy.

As a rule, on account of the commonly associated secondary injuries, the treatment of injuries of the orbital cavity will have to be undertaken with the assistance of a surgeon or by him alone. However, the eye physician will frequently play an important part as advisor, when it must be decided, whether an eye, hindering the rational care e.g. of an injury of the brain, must be preserved, or whether it may be sacrificed as very probably being without value anyhow, on account of severe intra-ocular changes visible with the ophthalmoscope, or when there are sure signs of a tearing of the optic nerve.

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7. Papillary congestion caused by gunshot wounds of the brain.

Oberstabsarzt (Major, MC.) Prof. KYRIELEIS

Causes for increasing brain pressure in connection with injuries to the skull by gunshot are: hemorrhage, post-traumatic edema, post-traumatic swelling of the brain, increased secretion of spinal fluid and impediments to the secretion of spinal fluid.

Whether an increase of brain pressure in the rear area of the eye, for one or several of these reasons, finds a visible expression (congestion papilla, brain-pressure papilla) will depend essentially on the fact, whether the bone gap in the skull is open or blocked by bone fragments etc., as well as, whether the dura has been opened too or has remained intact.

Papillary congestion is most likely to develop if a bone gap is blocked, the dura is intact, but also very frequently if the dura has been opened while the bone gap is blocked, only very rarely will it happen with open bone gap and dura. The average degree of prominence will decrease in the same order.

Hemorrhages, causing increasing brain pressure, appear as a rule immediately after an injury. Papillary congestion caused by them appearing within the first 24 to 36 hours, is an urgent indication for surgical treatment.

During the first week post-traumatic edema and swelling of the brain do develop and later on decrease gradually. Infectious influences do not play an important part during this time (aseptic brain pressure phase). The pressure of the cerebro-spinal fluid is increased by increased secretion and is counteracted by an unlimited spreading of the edema, but contributes, however, to the general increase of brain pressure. After the first week inflammatory influences become more important, as causes of developing brain pressure.

Congested papillas, appearing after the end of the first week as a result of the stated symptoms, are no indications for an operation, which at that time is only determined by general local findings.

Remaining symptoms of congestion beyond the third week or reappearance of an already decreased papillary congestion are sure signs of a complication, in most cases of an abscess and will require renewed surgical treatment.

(Has been published in the "Archiv fuer Ophthalmologie").

The preceding group of lectures in connection with remarks made during the discussion suggested the following:



Directions for the treatment and transport of eye casualties.

An early expert care of the wound is of decisive importance for the fate of injured eyes. Their treatment is, on principle, to be undertaken by the ophthalmologist. For that reason, all wounded with eye injuries shall be transported as quickly and as carefully as possible to a well equipped eye department.

In doing this, it is to be taken into consideration that if a penetration of the eye injury is combined with injuries to other parts of the body, the injury to the eye takes absolute precedence with regard to operative care as long as there is no immediate endangering of life by other injuries.

Prior to and during the transport a disinfectant atropin ointment (perhaps marfanil-prontalbin 25 per cent, atropin 3 per cent) should be applied to the injured eye in order to secure a restful position of the inner and outer muscles of the eye and a bandage over both eyes should be made even in case of a one-sided injury.

On the accompanying paper is to be stated explicitly:  
"Eye injury. Quick, careful transport to the ophthalmologist."

Only if transportation conditions make it impossible to guarantee final expert treatment by a specialist within the first 3 days, does the temporary care remain in the hands of a non-specialist. To be considered is then the treatment of perforating injuries by a removal of any existing prolapse, to be followed by a covering up of the conjunctiva of the wound to avoid a further loss of the contents of the eye and to prevent a secondary infection and besides, in case of injuries to the lids the strictly conservative closure by suture of all preserved remnants of lid skin and the lid conjunctiva. Enucleation will be required of him only rarely as there exists no sympathetic danger within 8 to 10 days. Only the specialist may decide about enucleation of an only remaining eye.

Directions for the treatment of wounds due to intraocular foreign bodies.

A. Magnetic particles.

Foreign bodies within the eye, determined by objective diagnosis and X-ray picture must be localized accurately (CROMBERG method) and must then be extracted immediately if they are magneticles (magnet test); examination by sideroscope may be of additional value.

The extraction is to be made with the field giant magnet:

1. if possible through the wound,
2. otherwise in frontal direction, from the anterior chamber after its opening by incision with a lancet,



3. diasclerally by meridional incision only after renewed localization and only if after repeated attempts, the particle could not be drawn to the front; if necessary also by penetrating into the eye.

These rules apply only to small particles (2 to 3 millimeters) with smooth edges.

If the anterior portion of the bulbus is not injured, larger fragments (more than 2 to 3 millimeters) are extracted diasclerally if possible, through the wound. If a widening of the wound should be necessary, great care should be taken, as always, to avoid the ciliary region.

Under certain conditions, smaller, older fragments very firmly healed in, are best left alone, especially if the operation would mean a more serious danger than siderosis (refer to physicians committee).

In most cases small iron particles may remain in the orbita, larger ones are best extracted as soon as possible.

The possible presence of several magnetic fragments has always to be kept in mind: Final control through X-ray picture, also a final measure in the hospital at home.

#### B. Non-magnetic single fragments.

Single, non-magnetic fragments on the surface of the eye removed carefully after administering cocaine; the eye is covered with disinfecting ointment and bandaged.

In case of numerous non-magnetic fragments spread over the eye (glass, sand, gunpowder etc.) the treatment consists in the beginning in the application of antiseptic ointment and bandage, later on open treatment.

Non-magnetic fragments within the eye are only operated on early by the ophthalmologist if they can be removed without difficulty from the anterior portion. If an infection has already set in, a simultaneous drainage of the anterior chamber, covering of the conjunctiva, antiseptic local and general treatment is advisable.

Deeper lying non-magnetic fragments should for the time being remain in the eye, their removal should be left to the home hospital. In this case a diagnosis of the type of the splinter would have to be made followed by a decision, whether the operative removal of the fragment is to be tried in consideration of its type, its size and location, or whether it is justifiable to let the splinter remain in the eye. On account of the difficulty of a decision and the difficulty of such an operation, injured men of this category should be transferred to certain hospitals adequately equipped.

Regarding the transport, it is proposed to send a man injured in the eye along on the transport from a hospital to the base hospital with a transport paper, instead of an accompanying paper attached to the patient's hospital record; this transport paper is to give personal data of the patient, the medical unit the patient is coming from, the kind of further transport, the character of the eye injury, the necessary treatment during transport, and the destination of the transport.



Besides these directions, the common experiences of the present ophthalmologists from advanced hospitals led to the following proposal:

Experiences on the Eastern front showed that, to the detriment of the patients, it is very often impossible, even with the best of intention, to transport them to the eye hospital quickly enough. This is the reason why every army physician should have at his disposal an emergency group of ophthalmologists (ophthalmologist with an assistant, two helpers, giant field magnet and set of operating instruments) which is attached to the field hospital department, and is employed in places with increased demand in connection with a field hospital equipped with X-ray apparatus.

## 8. War blindness.

### Stabsarzt (Captain, MC.) LEHNERS

Survey of the character of war blindness in its effects on body and soul.

Survey of the causes of injuries and diseases leading to blindness, based on the experiences of 453 cases of the war blind collection hospital, Reserve Hospital # 132, in Berlin:

#### A. Caused by enemy action:

1.	Pistol	0	=	0.0 %
2.	Carbine and M.G. bullets	74	=	16.2 %
3.	Shells of all kinds	160	=	35.1 %
4.	Mines of all kinds	108	=	24.0 %
5.	Airplane bombs of all kinds	10	=	2.4 %
6.	Misc. (burial, uncertain causes)	3	=	0.7 %
		355	=	78.4 %

#### B. Caused by accidents due to war:

1.	Accidental ignition of own explosive charge and similar accidents	24	
2.	Careless handling of explosive charge and similar accidents	15	
3.	Through crash (airplane, automobile, etc.)	5	
4.	Misc. (piece of wood, saw blade, hoof kick, nail, bolt)	6	
		50	= 11.1 % = 405 = 89.5 %

405 = 89.5 %

C. Caused by diseases:

1.	<u>Keratitis</u> (in certain cases, late plastic operation)		3	
2.	<u>Aphakia combined with:</u>			
	a. Amotio retina	2		
	b. Iridocyclitis	1		
	c. The same, with glaucoma	1	4	
3.	<u>Atrophy of the optic nerve:</u>			
	a. Methyl-alcohol poisoning	5		
	b. Results of febrile illness	5		
	c. Neuritis retrobulbaris	5		
	d. Focal cephalitis	1		
	e. Meningitis	4		
	f. Prog. paralysis	1		
	g. Leber's optic atrophy	1		
	h. operated brain tumor	4		
	i. operated cerebellar abscess	1	27	
	= 74.9 % from all diseases		34	
4.	<u>Severe changes of the vitreous body</u>		1	
5.	<u>Heredo-degeneration of the maculae</u>		2	
			37	= 8.1 %
6.	<u>Sympathetic ophthalmia of the 2nd eye:</u>			
	through injury (lead missile)	1		
	after operation of cataract	1		
7.	Simulation		1	-

D. Caused by attempt at suicide  
(till 8 August 1941)

10 2.4 %

(till 8 August 1941 = 150 new cases,  
applied to this 6.6 %)

Fatal cases:

Late abscess in the brain	4
Brain tumor	1

(Editor's note: The figures given above are exactly as they appear in the printed original.)

Total	453	= 100.0 %
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Conclusions regarding protection of the eye.

Survey of the remaining power of vision. Illustration to the plan not to hand over certain cases, until now considered as "practically blind" to the technical training for the blind in the future, but rather to train them somewhere in special practical courses with all optical auxiliary devices (telescope spectacles etc.) in order to reestablish them, if possible, in their former occupation or a similar one.

Survey of additional damages requiring training for another occupation. Illustration of the possibilities of training for another occupation rendered difficult by additional body defects.



Survey of the total of war blind of the present war, already employed:

Mechanics and artisans	112
Telephone operators or wireless operators	60
Stenographers, clerks, candidates for civil service	58
Industrial laborers	17
Independent business men	12
Manual work, for instance packer	10
Masseurs	11
University graduates, higher officials etc.	8
Farmers	4
Travelling salesmen	4
General occupations with the Armed Forces, the Waffen-SS, the Labor Service	3
Concert singers	2
Interpreters	1
Writers	1
Business managers	1
Total	<u>304</u>

Pointing out the special necessity for timely instruction of the war blinded concerning their condition, before their transfer to the collecting hospitals, offering facilities for training, and a very cautious establishing of a prognosis *quo ad visum* in the case of the practically blind (danger of phthisis) to avoid mental reactions and in the interest of a solid basis for the training, founded on the experiences at our disposal.

Survey of the different ways of war blind training and the technical devices required for this.

#### Discussion:

SCHMIDT: The necessity of special training institutions for weak-sighted men is emphasized. For practical and psychological reasons it is not advisable to mix them with the totally blind in a training institution for the blind. It is not sufficient to establish hospitals in which the weak-sighted are equipped with auxiliary optical devices. There are not a few weak-sighted who cannot be assisted with auxiliary optical devices. They too must be made fit by special training for taking up again the occupation they learned. Younger weak-sighted men too are to be given the opportunity to take up a profession which demands only limited powers of vision.

LOEHLEIN: A number of eye hospitals in the homeland, nearly all of them university eye clinics, have lately been entrusted by the Army Medical Inspector with the special care of particularly weak-sighted members of the Army in order to separate them from the blind or practically blind, and to enable them by practical testing of special optical devices (telescope glasses, magnifying glasses etc.) also, when needed, by adequate training to take up a profession for people with normal eye-sight. The overwhelming majority of them are men who, although still able to go out into the streets, cannot read without special auxiliary optical devices. As far as the central power of vision may give a clue, the lowest limit would probably be around a power of vision of  $1/50$ , the upper limit around  $1/10$ .

9. Fitness of eye casualties.

Together with directions for evaluation of the fitness of men whose eyes have been injured.

Generalarzt (Brig. General, MC.) KLEIBER

The following directions are proposed for an evaluation of the fitness of men whose eyes have been injured:

Conjunctiva: Synblepharon with chronic irritation, double vision and disturbances of movement, are fit for home garrison duty or civilian labor duties.

Lacrimal ducts: Closures and fistulas without purulent discharge usually do not impair fitness for active service. For this reason classification as L 22 is too strict.

Strabismus: Fitness for active service is not impaired by concomitant squinting; the squinting eye must, however, not be practically blind. In case of paralytic squinting constant double vision demands the classification as for home garrison duty or labor duties.

Cornea: In the case of inflammation of the cornea disposition to relapse does not always exclude fitness for active service or front garrison service, this is, however, very often the case with herpes and keratitis dendritica.

Practical blindness: This condition cannot be defined absolutely in figures. The stated degree of vision of 1/50 has sometimes to be passed to nearly 1/10.

Iris: Healed over, non-relapsing iritides are to be judged according to the degree of vision remaining.

Lens: In the case of stationary cloudiness of the lens, the fitness for service depends on the degree of vision; progressive cataracts of both eyes allow at the most, labor duties. Aphakia in one eye makes the man fit for active service if the injured eye with correction reaches at least 1/4 of normal vision and other eye is in good condition.

Aphakia of both eyes - fit for home garrison duty or labor duties. If the only eye remaining is aphakic - fit for labor duties. Unfit for army service.

Lens luxations - fit for labor duties. Home garrison duty.

Vitreous body: In case of cloudiness, findings and cause are to be considered, not only the degree of vision. Chronic disease of the ciliary region or recurring hemorrhages of the vitreous body make the patient fit for labor duties. - Unfit for army service.

Choroid - Retina: Scars and old circumscribed spots do not impair the fitness for active service. Old detachment of the retina of both eyes after an injury, fit for labor duties, or home garrison duty. Garrison duty in individual cases if operated on with good permanent result, even garrison duty in the field (occupied territories).



Optic nerve: With atrophies due to injuries the degree of vision and the range of vision are decisive, the same applies to amblyopias due to intoxication. One sided central scotoma after an affection of the accessory sinuses is - fit for active service.

Glaucoma: Primary glaucoma is fit for home garrison duty or labor duty, while the one-sided secondary glaucoma allows home garrison duty only.

Homonymous hemianopsias: Are to be judged according to range and kind of the remaining field of vision, fit for home garrison duty to unfit for army service.

Anomalies of refraction: Number B 25.1 demands a degree of vision of  $1/2$  if the correcting glasses do not exceed - 6.5 or + 3 D. This request would also be sufficient for greater anomalies of refraction of number B 25.2, for the degree of the faulty refraction is less important. A degree of vision of  $1/10$  and less is not fit for military assignment.

According to the patients records in the archives for army medical science of the total number of wounded only 2.1 per cent are men with injuries to the eyes. The reasons why this figure is so small compared to the 8 - 10 per cent of the first World War are that most of the wounds are due to mobile warfare.

The statistical results are shown in the enclosed schedules. Because only finished cases were considered the judgements were final. They only refer to injuries to the eyes, other concomitant body injuries have not been taken into consideration.

The figures for total loss and blindness of both eyes are probably too small, because the records of the blind are still in the hospitals for the blind, and, up to now, were only rarely handed over to the archives for army medical science.

#### Discussion:

ROHRSCHNEIDER: Is of the opinion that many mistakes made in the evaluation of fitness for army service are results of a too literal observance of the schedule of defects. He therefore proposes to modify the evaluation of defects of soldiers in conformity with the new points of view in order to obtain a uniform evaluation of the fitness for army service in the case of soldiers with eye defects.

OBERHOFF: In our army a modification of the opinion concerning fitness is only possible by the leading medical officer (as proposal by the medical officer in the field). The leading medical officer arrives at a decision after an examination by a specialist named by him.

KRUSIUS: If possible full scope is to be given to the physician for individual non-schematic judgement. Illness or inferiority shall under no circumstances protect a man from performing some duty, but this duty shall be such as to secure the best possible performance and use in each individual case. In accordance with total war, however, this use is only limited by the "unfitness" rate (for the individual may serve in various branches of the Armed Forces, SS-police, Airforce, Navy and civilian Labor Service).

MUELLER: For the opinion "fit for front garrison duty" one has to consider that the man concerned will possibly have to do duty not behind the lines but in the front line.

HEINSIUS: 1. Confirms the experiences of faulty judgement. In most cases the reason for it is insufficient consideration of the regulations for examination and classification of recruits.

2. As range finders the war-wounded cannot be employed. For the examination of the range finders of the Navy, precise directions have already been drawn up which contain all regulations necessary.

3. For squint-eyed recruits an operation is advisable to avoid military difficulties; hardly any cases of double vision have been observed.

4. Relapsing diseases of the cornea require treatment in the same hospital, as a change of attending physicians is usually unfavorable to the restoration of fitness for active service.

COLLIN: Is of the opinion that patients suffering from glaucoma, whose disease is compensated, may be considered without hesitation as fit for home garrison duty if their power of vision and field of vision is sufficient.

DIETER: In the case of hemianopsia of the right side the well-known complaints while reading may be eliminated surprisingly easily and quickly if the person concerned learns to read with the book turned around from the right to the left and the lines from bottom to top. - Occasionally the well-founded judgement of a wounded man is disregarded by the medical officer in the field. I know of several cases where wounded men, who were at least fit for front garrison duty, were discharged by the medical officer in the field as "fit for civilian labor duties at the best".

SCHMIDT: Tuberculous eyes have to be judged in each individual case. Especially are to be considered the length of time elapsed since the last transfer and the kind of occupation since then.



10. About night blindness and other disturbances of the light perception.

Professor VOM HOFE

More than 2000 cases were observed. Apparatus: Engelking adaptometer made by HARTUNG with adjustable intensity of current. The normal dark adaption, which was tested in a 1000 persons who had no disturbance of night vision, fluctuates in proportion 1:5. Thus there are persons without disturbances having good, medium and below the average adaption. The latter are unfit for night-fighting and night-observation. The distribution curve of the normal adaption resembles a binomial curve. The average rate of frequency is a little below the calculated average rate. Only such persons may be rated as night blind or hemeralopes, whose final rate, after 30 minutes, is 1/15 or less of the average rate of frequency. Slighter reduction has to be considered as a weakness of light perception. In the majority of these cases there are simultaneous refraction anomalies of all kinds (not only myopia), as well as nystagmus amblyopia, keratoconus and other symptoms of an inferior construction of the organ of vision, sometimes hereditary. Simulation plays only an unimportant part. Only a small percentage of the cases shows signs of a lack of vitamin A. An exact anamnesis is necessary for their discovery. The vitamin A content of the whole blood and dark adaption show no parallelism. Besides the positive result of a diet supplement with Vogan (proprietary vitamin A preparation) carried on for about two weeks, only a rate below 50 is a sign of a lack of vitamin. Persons with good dark adaption will find an acquired reduction, even one to be rated inside the normal dispersion much more disturbing than others with a constitutional weakness of light perception. Decrease to 1/3 and less of the average frequency rate should be classified as unfit for field service and night duty (weakness of light perception of a considerable degree).

Discussion:

OBERHOFF: I think it is dangerous to ask every man during the medical examination, as proposed by VOM HOFE, whether he sees badly in the twilight. As a matter of fact one should talk as little as possible with laymen about night blindness; the expression "war hemeralopia" should especially be avoided, a term I am very sorry to say has cropped up again.

MUELLER: Would it not be possible in the examinations of adaption to normalize the regulations for the conduct of examinations as regards current potential, light potential and light adaption.

HEINSIUS: The vitamin A contents of the blood show variations during the course of the day so that it is not possible to determine a lack of vitamin A by the blood serum. Reference is made to the research work of HAMBURGER and myself about attempts to standardize and possibilities for comparison as well as the shortcomings of the adaptometers (see Klinisches Merkblatt fuer Augenheilkunde, 1943). - It is impossible to compare several adaptometers.



JESS: Points out that there always existed disturbances of adaption and field of vision in the case of test persons with distinctly decreased vitamin A contents of the blood caused by disease. Instead of the proposed term "weakness of light perception" it would perhaps be more practical to say "disturbance of night vision".

VOM HOFE: The reason why I consider the term "weakness of light perception" as much more appropriate is because by this, it is made quite clear that the adaption is bad. In certain cases persons with absolutely normal adaption have disturbances of night vision too.

#### 11. Concerning night vision.

Marineoberstabsarzt (Lieut. Comdr., MC.)  
Dozent HEINSIUS

During night fighting the soldier who recognizes the enemy first has the advantage. In the Navy aboard the submarines, patrol vessels and speed boats as commanders, lookout guards and bridge personnel, as well as aboard night fighter planes and bomber aircraft and at the optical apparatus of the anti-aircraft guns, soldiers with particularly good night vision are needed. For this reason, appropriate methods of selection were developed by the Germans as well as by the enemy. During night fighting one must be able to see with a light intensity below  $9.5 \times 10^{-3}$  (sunset or sunrise), or even below  $6.3 \times 10^{-6}$  (full moon). The examination of the transitional stage (cone vision and rod vision) is made with the nyctometer by COMBERG. The pure twilight vision (rod vision), however, cannot be measured with this method. As it is especially important for night fighting the examination of it is either to be made with the NOWAK-WETTHAUER device or with luminous-color vision test by TSCHERMAK-SEYSENEGG and HEINSIUS. The examination with luminous color vision tests has been developed by myself as an auxiliary method and has proven useful for practical purposes. The firm of Sydor, Berlin, supplies this device as a nyctoscope. It furnishes a good dispersion of the night vision capacity rates found. The examinations have to be made regularly after 40 minutes of dark adaption. Especially important is the elimination of the central scotoma which requires a special training in parafoveal vision. For the training in this separation of attention and visual line, the mentioned luminous color vision tests have been proven useful. The lecturer's own examinations of the regional distribution of night vision capability of the retina are mentioned; in the case of good night vision the best capacity is in a circular area of about  $20 - 40^\circ$  around the retina center. The observations by NOWAK, KOESTER, and FICK, v.KRIES and others, who obtained different values are to be interpreted as either due to individual peculiarity or as insufficient training connected with centripetal variations of vision. Local fatigue of the retina is eliminated by momentary observation of 3 seconds duration.



Further influences on night vision already ascertained in 1940 by my earlier examinations with the nyctometer can be confirmed again and are only mentioned briefly for this reason. It concerns individual variations which are dependent on the general physical condition of the individual in question. It is certain that here changes of the contrast function play an important part.

In conclusion it is pointed out that naturally it is the duty of the medical officer in the field to inform the commanding officers of all possibilities of improving the dark adaption and the capability of night vision. Measures for the improvement of night vision are mentioned briefly.

#### Discussion:

KYRIELEIS: The most reliable method now for testing perception in the dark is the method of NOWAK, for an examination, especially in the case of mass examinations, the instrument developed by the Auer company is the most reliable one. For training in vision in the dark the instrument by HEINSIUS seems useful.

HEINSIUS: Unfortunately an examination with the apparatus used by the Airforces serves only for testing sensitivity of differentiation. It remains to be seen, whether precise statements can be made of the capability of vision which tests contrast vision and resolving power in addition to light sensitivity.

#### 12. Aggravation, simulation and hysteria.

##### Oberfeldarzt (Lt. Col., MC.) Prof. COLLIN

During the war an ophthalmologist frequently has the difficult task to decide whether the visual disturbance claimed by a draftee or member of the Armed Forces is simulated or of a hysterical nature. Such a decision involves extremely high responsibility on the part of the specialist, as the war regulations provide the death penalty for every one who tries to evade military service by simulation.

All our objective and subjective methods of examination which have proven efficient for the detection of aggravation and simulation of visual disturbances aim at changing the methods of observation so as to proceed in such a way that the person examined cannot use his imagination in following the course of the examination which results in contradictions with the optical and physiological rules. The less the person to be examined knows about these rules upon which the test methods depend, the less complicated (and therefore harmless) the testing procedure appears and the less time the person to be examined has for reflection, the quicker will one succeed with the simulation tests. It requires, however, a great deal of experience for the specialist,

patience shrewdness and knowledge of human nature, to prove that the person to be examined has in reality a greater acuity of vision than pretended and that the acuity of vision proven by figures means fitness for military service.

In view of the serious consequences in a court martial of a "simulation of visual disturbances", the principal requirement is made that the diagnosis of a proven simulation may only be stated in writing by the examining specialist if no objectively justified aspect of disease exists, because of the pretended visual disturbance, and if the fitness for military service can be clearly proven according to the classification for fitness. In all difficult and doubtful cases, a clinical observation in the eye department of a reserve hospital located at the army district physician's headquarters and a provisional opinion after consulting a second eye specialist as well as a neurologist is recommended, before the final opinion is given, so that a wrong diagnosis may be absolutely avoided, considering the grave decisions to be made.

#### Discussion:

ROHRSCHNEIDER: To avoid the serious court martial consequences of simulation, it is recommended to instruct the soldiers accordingly before the beginning of the examination.

HEINSIUS: The rank of the examiner often plays a part inasmuch as a Major (MC.) will get better examination results in a test of simulation than lower ranking officers of the medical corps. For detecting clumsy simulation the method of RIEKEN has been proven successful in Kiel, because malingerers are mostly of the opinion that during the adaption test they have to state low rates in the dark too. These persons are easily convicted by the optokinetic nystagmus.

DIETER: Soldiers suspected of simulation are admitted to the ward for "an observation" of 3 or 4 days and watched unobtrusively. The examination and final judgement is then not so difficult.

JESS: Mentions a case of artificial conjunctivitis of a civilian pilot who had alleged constantly recurring serious irritation of the conjunctiva caused by dural (aluminum alloy) dust which he maintained by suitable measures.

KAISER: For detecting simulation of blindness in one eye the optokinetic nystagmus is of great importance too and may also be made by an improvised drum, for examination at different distances from the person to be examined.

LOEHLEIN: The hope to clear up doubtful cases of suspected simulation with the aid of objective determination of the visual power by OHM's nystagmus test can unfortunately not be realized at present, as the apparatus used by OHM and recommended by him is at present not available in working condition and has not yet been installed and tried out in other places.



COLLIN: In his final remarks points out that in his experience stubborn malingerers are often not diverted from their purpose by being informed of the grave consequences of a court martial, but on the contrary in some cases even got their relatives to lodge a complaint with the superior authorities about their being suspected of simulation.

### 13. "Trachoma".

Stabsarzt (Captain, MC.) Prof. ROHRSCHEIDER

It is not to be supposed that trachoma may spread epidemically as a result of war activity in trachoma infected countries. The experiences made during the decade after Napoleon's campaign in Egypt of the spreading of contagious inflammation of the eyes, the so-called Egyptian inflammation of the eyes, nearly all over Europe, when the number of the blind in the different armies amounted to thousands, does not apply to the disease which we call trachoma today. The contagious inflammation of the eyes raging in the beginning of the last century was not trachoma but another disease. To avoid occasional infection through contact of the troops with the civilian population infected with trachoma, instructions given regularly by the physicians in the field according to Army Manual No. 209/1 (instruction leaflet concerning trachoma) are sufficient.

An important question is the evaluation of the military fitness of trachomatous men. It is to be expected that even now and in the future more than hitherto, trachomatous draftees will have to be classified during preliminary examinations and more trachomatous soldiers will have to be treated on account of the inclusion of groups of the population in the German area which show in part a considerable percentage of trachomatous persons, (e.g. people of German descent removed from the East). The following viewpoints have to be considered in judging trachomatous draftees: Draftees with trachoma healed or inactive for the time being cannot and do not need to be exempt from military service, draftees in a stage of active infectious trachoma are also to be drafted for military service, but have to be sent immediately to a suitable hospital for treatment. A part of these will have to be judged as fit for active service after a treatment of 3 - 4 months, the rest will have to be judged as unfit for service. By this compulsory treatment of trachoma, not only the interests of the Armed Forces are safeguarded, but at the same time the civil measures for fighting trachoma are effectively supported. Unfit for active service are only those men suffering from chronic infectious trachoma who are not amenable to treatment.

### Discussion:

LOBECK: In the Northern part of the Eastern front we found among 400 civilians 15 trachomatous ones, among 4000 soldiers with eye diseases only 3.

CLAUSEN: There is very little danger to our Armed Forces of being infected with trachoma by trachomatous civilians. Trachoma is only transmitted by direct infiltration of infectious secretions into the conjunctival cul-de-sac. There is mentioned the case of Austrian soldiers during the first World War, when, through using of the same towel by ten or twelve soldiers, trachoma was, so to speak, inoculated. Sulfonamide preparations have the best effect in the case of a new case of trachoma. Older trachoma stages are almost absolutely uninfluenced by it.

JESS: Mentions a number of cases in which somebody established a diagnosis of trachoma and prescribed sulfonamide treatment. An examination made afterwards, by a clinic in Leipzig, showed that these cases were completely free of trachoma none of them had, however, got the prescribed sulfonamide treatment. The first erroneous diagnosis would therefore have led to a serious error about the success of the sulfonamide therapy.

LOEHLEIN: As regards the treatment of trachoma with sulfonamides: As collective reporter of the experiments in the treatment of trachoma with sulfonamides made in many places simultaneously for more than a year, I should like to state: In general the conviction that the trachoma germ is finally killed in this way is not prevalent. In spite of this, it is a striking fact that the subjective and objective manifestations of inflammations will usually decrease soon with this treatment. Thus it is possible by a combination of the mechanical and medicinal local treatments at present used to accomplish the latter much more carefully (by which certainly many secondary injuries such as cicatricial entropion are decreased), and besides this to accomplish a clinical cure in about half of the time required until now.



II.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON SURGERY

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Translation prepared by:

Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section

Minor and major surgery in the case of tuberculosis of the lungs

(See Section XII, Articles 6 - 7)

1. Reamputation and stump treatment.

Together with: Directions:

Oberstabsarzt (Major, MC.) Prof. KREUZ

1. Reamputation serves to obtain the best usefulness in the case of incompletely or imperfectly healed stumps or physiologically less valuable or technically useless stumps.
2. Without exception a reamputation is to be performed at a time when the stump is sound, except in the particular pathological area.
3. The particular pathological area too must be free from inflammation and infection. Bone healing must be complete. Removal of sequestra and exostoses must have been performed previously. Open areas of the soft parts with fresh granulations are to be healed by transplanting epithelium before reamputation.
4. A stump is ready for reamputation if it shows no signs of inflammation of its soft or bony parts. The wounded person must be in a good general state of health.
5. The readiness for reamputation cannot be accelerated. The stump needs rest and time to become ready for final shaping. No premature exercise therapy, no premature operations should be done otherwise reinfections will result.
6. For reamputation peacetime considerations regarding the employment of the stump determine the choice of the site for amputation.
7. For functional employment a difference is made between stumps which require a prosthesis and stumps which do not require a prosthesis. All leg stumps absolutely require a prosthesis (with exception of certain foot amputations). The majority of the hand stumps and the forearm stumps do not require a prosthesis. Only the upper arm stumps (of the arm between the shoulder and the elbow) require a prosthesis partly conditional, partly unconditional.
8. In all arm stump reamputations the greatest conservatism should prevail. Defects of the soft parts are to be covered plastically if possible. The chance given for the forming of SAUERBRUCH-channels to secure motion of the artificial hand must not be jeopardized. Nor is it permissible to sacrifice parts of the hand and the arm which could be made into natural gripping organs in favor of an artificial arm.



9. Directions for reamputation of the leg (diagram). We distinguish three zones: dispensable, indispensable, and inconvenient.

In the dispensable zone a shortening of the stump length may be made to cover soft parts plastically.

The sphere of activity for flap plastics is in the indispensable zone. Here no centimeter of bone may be sacrificed unless it is absolutely unavoidable.

In the inconvenient zone the removal of the limb section in question is demanded for good cooperation between stump and prosthesis for physiological or technical reasons.

10. Amputations of hands and feet having become deformed in healing and functionally of inferior quality are only to be performed after joint examination by specialists. It is wrong to sacrifice a seriously damaged hand of limited function forthwith. Here an attempt at plastic restoration is advisable.

#### Discussion:

SAUERBRUCH: Speaks about the practical importance of the automatically movable hand and the mistakes of the operative technique.

HELLER: Recommends the epithelization of granulating places on the stump before reamputation is made.

GULECKE refers briefly to the question, whether in the case of reamputations because of injuries to cold, tetanus antitoxin is to be injected once more. The transplanted skin flaps over stumps are numb for a long time and must not be subjected to strain.

USADEL: Says that onesided circular incision is only advisable in the case of gas burns.

HOCHE: Recommends the periarterial sympathectomy before reamputation in the case of injuries due to cold.

SCHOENBAUER: Says that in 90 per cent of the cases reamputations of the stump have to be made. He recommends the two phase amputation.

LEHMANN: Recommends an early beginning of the extension of the soft part on the stump.

2. Treatment by exercises and mobilization of the joint.

Together with: Directions:

SS-Gruppenfuehrer (Lieut. General, (Elite Guard))  
Prof. GEBHARDT and  
Standartenfuehrer (Lieut. Colonel) SCHULZE :

1. The after-treatment must be a logical continuation of the operative and bandage treatment, consequently it must always be controlled decisively from the surgical point of view.
2. The possibilities of using the treatment by exercises can be subdivided into gymnastics of the patient, supported by the measures stimulating the circulation, especially by massage, passive muscular exercise, sports suitable for wounded and occupational therapy.
3. During the creative phase of active reconstruction, which is characterized clinically by healing in the narrower sense, by symptoms of inflammation and irritation, any mechanical disturbance is injurious.
4. The indications for treatment by exercise are determined:
  - a. by the condition of the layers of tissue, the former wound area,
  - b. by the conditions of the circulation of the blood,
  - c. by the remainder of additional injuries (infections),
  - d. by the intact state of the nerve system,
  - e. by the possibilities of using the injured limb.
5. In addition to the usual training methods only suitable detailed work will be successful (pulling, pressure, pushing gymnastics, passive motion treatment).
6. It goes without saying that a modern exercise treatment cannot do without special apparatuses.
7. In case of congestion, any irritation caused by exercise and any artificial arterial hyperaemias are to be rejected.
8. Of the clinical pictures and hindrances in the case of limb injuries, contractures are the hardest to fight during the after-treatment. Contractures in the form of lingering inflammation are not suitable for motion treatment, instead of this they need:



- a. sufficient rest (immobilization),
- b. (arterial) hyperaemia as a remedy,
- c. skillful massage,
- d. for extension, permanent pulleys (triangle with pulley, simple pendulum, permanent expander, shaking apparatus, intermediate splints)

9. The rules for the after-treatment of peripheral motor paralysis and paralysis caused by injuries to the limbs are:

- a. a practically useful regeneration of the motor nerve tract can only be secured with smoothly gliding joints and tendons. A removal of the contracture must precede any treatment for nerve trouble;
- b. spontaneous recuperation or a surgically prepared one is endangered by over-extension, overstraining;
- c. the recuperating nerve tissue is extremely sensitive against irritation and requires short periods of intensive stimulations with long intervals of rest from irritation;
- d. shaking and traction exercises are to be combined with skillful massage;
- e. electrical examination and electrical gymnastics may sometimes be of decisive importance, though only if they are made by a thoroughly experienced physician and are at least well regulated by him

10. Soldierly bearing must come first before sport for the wounded, just as during the clinical treatment. During the time of efficiency a man must strain every nerve so that he needs rest during each interval, therefore also when he is in hospital.

11. A cautious moving of the limbs under anaesthesia may be attempted only exceptionally in case of the consequences of war injuries and only if X-raying shows that the articular space is free, consequently only in case of primary adhesion of the soft parts.

12. Better and more conservative are Quengel-bandages and intermediate splints.

(Note: Quengel-bandages are moulded splints applied securely to a limb, so arranged with a hinge that the joint (elbow or knee) can be manipulated slightly without motion of the adjacent bones in the arms of the splint.)

13. Remnants of "badly demolished joints" with extensive cartilage defects first of all require stiffening. If conservative measures do not lead to synostosis early resection is indicated.

14. For the final conditions besides resection (painful primary adhesion of connective tissue which cannot be modified or bony ankylosis) joint plastic is to be considered. Subsequently it requires a powerful muscle coat free of adhesions. The injured person must be young, perfectly healthy for the future and there must be human and professional need for arthroplasty.

Contraindications: Extensive adhesions in the area of the joints, deep immovable scars of the muscles, muscular defects, formations of callus hampering joint motion, paralysis. In case of infections with germs causing putrefaction, gas gangrene, gonorrhea, plastic operations are not advisable either. More important than schematic data (partial plastics and resection 1 year; total plastics 2 years after the infection has completely disappeared) is a long interval of freedom from local and general reaction.

The joint must be free from pain when used, the muscle must grow, dystrophy must disappear by degrees. The best way for the wounded person to acquire a self-critical attitude so as to desire stiffening or plastics is use of the limb every day. The partial plastic represents the minor operation. It is practicable earlier and is more easily performed. It is applicable mainly in the connective tissue parts of the joint.

#### Discussion:

MALLWITZ: Gives particulars of the training of the attending personnel (gymnastic nurses) and about the difference between "sports for the wounded" and "sports for the disabled".

### 3. Marrow nailing of gunshot fractures of long tube bones at the front.

Oberarzt (1st Lieutenant, MC.) Prof. KUENTISCHER

Marrow nailing is a treatment of bone fractures in which the fractured parts are connected by a nail of stainless steel. The nail is of lamella shape and rests in the marrow cavity. The fixation is so tight that every other device, such as plaster of Paris bandage or extension bandage is superfluous and the injured limb may be moved immediately without restriction. In the case of a fracture of the thigh, for instance, standing up and walking is possible without any apparatus after a few days. Only the nail, resting in the marrow cavity, replaces - as it were as an internal splint - the mechanical support, lost by the fracture. This has the immense advantage, that the damages resulting from the immobilization are avoided: such as muscular atrophy, stiffness of the joint, local and general impediments to the circulation. In the case of a closed new fracture the insertion of the nail is made under X-ray control through a skin incision of 2 - 3 centimeters length at some distance from the place of fracture. After the healing of the fracture the nail is extracted.



The experience of many hundreds of nailings showed that no essential damage of bones and marrow appeared in spite of the size of the foreign body, and that, on the contrary there is an extremely strong formation of callus, because the circulation remains unhampered by the movement.

Experienced accident surgeons only may use the method. It can also be used for complicated fractures, and is extremely suitable for the restoration of badly healed bone fractures, for pseudarthroses, spontaneous fractures etc.

The question whether gunshot fractures too are to be "nailed" has not yet been decided.

#### Discussion:

ROSTOCK: Tells about the known results of the marrow nailing of gunshot fractures at the front. Of nine cases four died, the fate of another four is unknown, one is cured.

#### 4. Marrow nailing of old fractures, threatening and existing pseudarthroses in the homeland.

Oberfeldarzt (Lt. Col., MC.) Prof. HAEBLER

1. The danger of infection with marrow nailing increases considerably by exposure of the fracture. While in the case of subcutaneous nailing only 1.5 per cent wound infections occurred, there were 5 among 45 cases of "open nailing" which is more than 10 per cent. Therefore in the case of old closed fractures, exposure must be avoided if possible. This is possible by a thorough mobilization before the operation. By this one succeeded even after 10 - 22 weeks in performing the nailing without exposure of the fracture site. One fatal case warns against nailing in case of a bad general state of health. The mechanical disturbances known as causes of delayed healing have also to be considered during the nailing. Most important for the leg is an additional plaster of Paris bandage if the nail does not put the fracture at rest completely. If, after mobilization, no accurate joining of the fracture ends, which is necessary for the insertion of the nail, can be secured, the nailing shall only be performed if more than six months have passed since the injury occurred and if the position of the fragments indicates that the setting of the fracture will considerably hamper the use of the limb. This applies also if already existing callous masses closing up the marrow cavity make it clear that exposure is unavoidable.

2. In osteotomy, on account of healing in a bad position, nailing is to be preferred to the other methods of joining the fracture ends.

Besides the achieving of an absolute resting position it has the advantage that a far reaching resection of the bone and a removal of the periosteum is avoided. For relieving the hemorrhage, drainage is recommended. In the case of formerly infected fractures and gunshot fractures it is absolutely necessary.



3. Of 35 old gunshot and infected fractures or in case of pseudoarthrosis caused by such, 3 patients with fractures of the thigh died. Besides a minor fat embolism no cause of death could be ascertained in one case, in the second case the wounded patient was in a bad general state of health. With patients to whom an operation may prove dangerous, no nailing is to be performed. In the third case the omission of drainage resulted in a phlegmon and sepsis. All of the remaining 32 fractures showed bony healed, seven of them resulted in a local formation of sequestra, an occurrence which ordinarily cannot be avoided if the treatment is conservative. On the other hand, however, an infection extending beyond the fracture cleft is avoidable. This has been observed four times, especially in those cases the wounds of which were healed the longest time before. The cause was either insufficient drainage or neglect to additional support for those fractures in which the nail did not give sufficient fixation. In the case of two delayed healings mechanical causes (blocking fibula, existing defect) were responsible.

4 severely suppurating fractures showed bony healing without any extension of the infection, however, a nailing of such cases is to be performed only if one does not succeed in fighting the infection effectively with conservative methods, regardless of the position. If it becomes necessary in any case to expose the fracture on account of an abscess or formation of sequestra the resting position guaranteed by simultaneous nailing is a great advantage in fighting the infection. A technically correct nailing, care for a good drainage in the wound by keeping it open and drainage in the right place and additional immobilization by a plaster of Paris cast until the danger of infection is overcome are absolute requirements for success.

#### Discussion:

KOESTLER: Marrow nailing is especially suitable for correction of a fracture combined with a deformity, with shortening of the limb and for fractures of tropically affected limbs.

GOETZE: Points out the danger of infection and fat embolism. In case of pseudarthrosis the refracturing method is recommended.

BOEHLER: Reports on the result of two fractures of the thigh treated by him. At home he treated 50 old gunshot fractures by marrow nailing.

ORATOR: Reports on five cases observed by him.

LEZIUS: Had bad experiences in Paris with the marrow nailing of fresh gunshot fractures.

#### Directions for the marrow nailing of gunshot fractures of long tube bones at the front and at home.

The method stated by KUENTSCHER was in the first place meant for the treatment of simple fractures and has been proven successful.



The application of the method for war gunshot fractures too is tempting, as it saves extensive fixation bandages, especially for thigh fractures and upper arm fractures. Technically the method may be used at the front too, after the wound has been prepared surgically in a careful manner. The performance of the operation under as "bloodless" conditions as possible is advisable.

So far the experience with the marrow nailing of fresh gunshot fractures of long tube bones varies. A number of bad results have become known.

A favorable course of healing has only been noticed in such cases, where good chances for attendance and long observation by the operating doctor were guaranteed.

It is proposed that three or four army surgeons should be commissioned to test the method and report on the indications and the results obtained. For the rest of the surgeons the prohibition of marrow nailing of gunshot fractures in the field will remain in force.

The following directions are valid for hospitals behind the lines and at home:

1. Simple fractures:

With patients to whom an operation may prove dangerous because of their general condition no nailing is to be performed.

If the fracture is older than 4 - 6 weeks and if its position of fixation is satisfactory one should desist from a nailing. In case of a delayed formation of callus it is only to be performed if it is to be expected that open operation can be avoided. Before the performance of marrow nailing, however, a thorough mobilization for the leg, in certain cases a resection of the healed fibula, is to be made.

If, after mobilization no accurate joining of the fracture ends, necessary for the nail, can be accomplished in the extension device, nailing is only to be performed if more than six months have passed since the injury occurred and if the position of the fracture makes one expect a severe hinderance in the use of the limb.

2. In osteotomy, on account of healing of the limb in a bad position or in case of a pseudarthrosis, nailing is to be preferred to the other methods of fixing the bones.

Short drainage for relieving the accumulated blood is necessary. The nailing of fractures healed in a bad position and formerly infected or of pseudarthroses may be performed in the earliest case six months after the wounds have closed.

3. Infected fractures and gunshot fractures:

For patients to whom an operation may prove dangerous on account of their general state of health, nailing should be out of question.

In an otherwise good general state of health it may also be performed if the wounds have been healed only a short time or are still draining. Caution should, however, be observed.

It is necessary to perform technically correct nailings, assure good drainage of the wound secretion by leaving the wound open and draining in the right place and additional immobilization by a plaster of Paris cast until the danger of infection is overcome.

It is proposed to make the indication for nailing in the homeland depend exclusively on the decision of the consulting surgeon of the army district.

#### 5. Special test of sulfonamide effects.

SS-Gruppenfuehrer (Lt. General (Elite-Guard))  
Prof. GEBHARDT and F. FISCHER

#### Conclusions:

1. The development of a suppuration of the soft parts caused by bacteria cannot be avoided locally and internally even through immediate administration of sulfonamides.

2. In the case of abscesses and phlegmons of the limbs, it could not be ascertained whether the course of inflammation by aerobic germs was influenced by sulfonamide. In case of the combined therapy of gas gangrene the impression was obtained that there was a milder course under the effect of sulfonamide.

3. Surgical measures are absolutely necessary for keeping the inflammation in check.

#### Supplementary remarks:

The dusting of wounds with sulfonamide powder may have an injurious effect if by this, the surgical principles are violated, e.g. if the powder base does not dissolve in the tissue fluid and obstructs the outflow of secretions by forming a crust.

The wounds treated with sulfonamide powder show slightly less tendency to exudation.

#### Working hypothesis:

The inflammation in the mesodermal soft parts tends very early to a formation of necrosis. The center of the bacterial accumulation is the necrosis, the surroundings of which show thrombotic vessels. It is difficult of access for the chemotherapeutical agents.



### Discussion:

SCHREUS: As far as I understood the test procedure of Messrs. GEBHARDT and FISCHER they do not allow any direct comparison with the animal tests carried out by myself and others, because larger muscle parts were eliminated by tying off vessels and could thus not be influenced by the perorally administered sulfonamides (cavity effect). The range of locally applied sulfonamides, especially the insoluble ones must not be overestimated, as the conditions of diffusion are insufficient in consequence of the low solubility. Here marfanil is to be considered particularly. The bad adherence of gas gangrene infection which was emphasized by the speaker is completely identical with the observations in the animal test. Without special local conditions (crushing of tissue, disturbances of circulation) infection cannot set in. These view points must be specially considered for the surgical treatment too, as, altogether the testing of sulfonamides for war-wound surgery should not be made from the viewpoint of antithesis but from that of synthesis.

### 6. Sulfonamide treatment of gunshot wounds.

Oberstarzt (Colonel, MC.) Prof. FREY

Sulfonamide treatment of gunshot wounds can only be considered as additional therapy. Under no circumstances must the thoroughness of the surgical wound treatment and the carefulness of putting the wound at rest be lessened by it. It neither tallies with the experiences of the test nor with those practices that in case of wounds which can be treated surgically only very late, say after one day, the subsequent sulfonamide therapy will influence the course of infection particularly. This is the reason, too, why the custom of dusting gunshot wounds, in case of a late change of dressing, as is usual today in many medical units is of hardly any value. In some branches of medicine, however, sulfonamides have yielded such surprising results, that abandoning their application for the treatment of gunshot wounds can hardly be justified. In order to get better results, it seems advisable to keep more to the experiences of animal tests. According to these a decidedly favorable effect on gunshot wounds is only to be expected, if sulfonamides are applied very early, that is even during the first few hours after the injury was incurred. If a wound can be covered reliably with powder in its entire extension, with the first three hours, and if the dusted tissue is still capable of reaction that is if the blood circulation is good, the outlook of success should be better.

The local powder treatment is superior to peroral and parenteral therapy on account of the higher concentration of the sulfonamides attained at the seat of the infection. Grazing shots, tangential shots and wide gaping wounds are to be dusted with sulfonamide powder as soon as possible, therefore by the field surgeon.

Deeper lying injuries, such as perforating shots and shots with the missile lodged in the affected part, have first of all to be thoroughly treated surgically at the main dressing station or at the nearest field hospital. Only after that is the dusting of the wound done and special care has to be taken that its deepest pockets too, from which the serious infections are likely to set in, are dusted sufficiently.

If the local dusting treatment is not sufficient (e.g. because the deeper layers could not be reached) or if it is not possible early enough, it is to be replaced or to be supplemented by intravenous or peroral doses of sulfonamides. They are applied prophylactically as well as therapeutically in the form of intensive therapy. According to the degree of the danger of infection, 6 - 10 grams are given for 3 - 4 days but under no circumstances irregular small doses which are insufficient to prevent inflammation, of no use and if given over a longer period may even have an injurious effect.

In the case of wounds under suspicion of gas gangrene a daily dose of at least 100 cubic centimeters polyvalent gas gangrene serum should be given intravenously.

In the case of abdominal wounds the application of Cibazol powder or of a liquid sulfonamide is to be recommended after a carefully performed operation.

## 7. Injuries caused by intrathecal administration of sulfonamides.

Stabsarzt (Captain, MC.) Dozent H.-R. MUELLER

No agreement yet exists in meningitis therapy concerning the method of using sulfonamide (peroral, parenteral, intrathecal). With intrathecal injection every remedy foreign to the tissue such as sulfonamides may cause an immediate injury to the central nerve system as a result of the missing buffer action of the cerebro-spinal fluid.

Eubasin, so effective when administered perorally and parenterally is dangerous intrathecally on account of its alkalinity. We can add another case report to the more than twenty serious injuries to the spinal cord mentioned in the literature. In the case of a meningitis patient a flaccid **paralysis** appeared with paralysis of the bladder developing in 48 hours after an intrathecal injection of eubasin in a field hospital.

Injuries are, however, seen also after the application of sulfonamides, generally considered as harmless intrathecally. Thus we observed in the case of suppurating meningitis after the administration of prontosil a temporary paralysis and weakness of the bladder and OBERDISSE reported on two severe injuries to the spinal cord after intrathecal injections of albucid. An intrathecal administration of sulfonamides cannot be advised because of these dangers, especially as it has been proven experimentally that immediately an ample resorption



into the blood channel sets in and as a result of the sudden decrease of cerebro-spinal fluid concentration no diffusion worth mentioning can reach the real seat of the meningitis. Nor is it possible to secure any effective local therapy of meningitis from the cerebro-spinal fluid space because of collections of fibrin in the meninges and because of the seats of inflammation in the cerebral cortex.

#### 8. Sulfonamide treatment of infectious dermatoses.

SS-Sturmbannfuehrer (Major (Elite Guard)) Prof.  
VONKENNEL

Sulfonamide treatment of infectious dermatoses need not be restricted to the known parasitic ones but must also be regarded as the best first therapeutic measure for all secondarily infected ones. Until now we have only had disinfectants at our disposal; albumin precipitating ones such as carbolic acid or the hydrargyrum praecipitatum album: oxidizing ones to which also belongs chlorous toluolsulfonamide "chloramine", or dyes such as trypaflavine and methylene violet which besides a dye component contains a nitrogen element combined with a quantivalence of five. By disinfection is meant a killing of the living cell by direct destruction of its structure. Disinfection is a catastrophe of the form. In the course of the functions of life it means an irreversible process and cannot consider any differentiation of the cells. For this reason an internal disinfection is impossible, and even if it is applied locally irritation often sets in. By administering sulfonamides we practise chemotherapy. Chemotherapy is a retardation of function. It aims at the function of the primitive germ cell without affecting the function of the differentiated organic cell. In accordance with this essential difference between disinfection and chemotherapy, the surgeon should disinfect the surroundings of the area of operation, treat the wound itself locally and internally by chemotherapeutics. For the dermatologist too, the chemotherapy of infectious and infected dermatoses is a new departure. As the best form of local application an ointment of at least 10 per cent it to be recommended. The addition of Novocaine, tutocaine, or anaesthesin neutralizes the effect of the sulfonamides.

The incorporation of a sulfonamide salt soluble in water has proven better than that of pure substance. Albucid and globucid form neutral sodium or triaethanolamin salts, eleudron, and pyrimal only alkaline sodium salts. For this reason only albucid and globucid are to be considered for incorporation in a form soluble in water, since we decline alkaline ointments. Eleudron and pyrimal must be incorporated in a firm substance. In order to avoid infection by production of spores the substance must, just exactly like powder, be sterilized by means of heat. As a base vaseline and lanolin or anhydricous lanolin may be used. 10 per cent globucid vaseline is to be recommended as the best remedy for all infectious dermatoses from impetigo contagiosa to the deep trychophytoses, for injuries due to cold, burns, ulcers, pemphigus, etc. In case of strongly oozing processes moist bandages with a 5 per cent solution of globucid

can be made. For impetigo contagiosa, herpes zoster and especially for post-scabitic treatment, the following shake mixture has proven effective:

Globucid  
Talc. venet.  
Glycerin  
Aqua destillata ad 25.0

As a therapeutic agent the powder is hardly of any importance, rather as a prophylactic if there is an inclination to intertriginous and interdigital eczema. Marfanil-prontalbin powder compounded of one part of marfanil and nine parts of sulfonilamide has no use for the dermatologist; neither can tibatin be used locally. Since a cure of infectious dermatoses is also possible perorally, this may be combined with local treatment, for instance in case of cutaneous and subcutaneous processes such as furunculosis, abscesses, ecthyma, erysipelas, phlegmonosis, deep trichophytosis and is especially suitable for shortening the time of treatment.

#### 9. Injuries caused by sulfonamide treatment of gunshot wound.

Oberstabsarzt (Major, MC.) Prof. RANDERATH

The speaker discriminates between the following kinds of injuries caused by sulfonamides:

1. Direct injuries which, according to the course of disease and the results of the post-mortem examination caused an injury to be regarded as due to a poisonous effect of the preparations used upon certain organs or tissues and
2. indirect injuries which mislead one under the effect of therapeutic sulfonamide doses to assume a favorable course of the war-injury infection which somehow resulted in an injury for the wounded.

In the area of the army known to the speaker in which systematic sulfonamide prophylaxis and therapy was practised direct injuries caused by sulfonamides were extremely rare. Fatal injuries to the liver or kidney were not observed. On the other hand the speaker noticed two cases of agranulocytosis, one of them after the administration of 45 grams of cibazol which was cured after the sulfonamide treatment was stopped. In this case the exitus resulted, after complete disappearance of the agranulocytotic blood picture, from a progressive wound infection after an injury by a shell fragment on the left buttock with an extraperitoneal injury to the rectum.

Indirect injuries caused by sulfonamides are noticed more frequently. Their origin is to be traced back in the great majority of cases to a failure of the therapeutic effect of sulfonamides. The speaker mentions some examples.



On the whole, injuries caused by sulfonamides are so rare, that no contra-indication of the sulfonamide treatment of the gunshot wound infection can be derived from this. This final conclusion is to be made independent of the question of the effectiveness of sulfonamide prophylaxis and therapy of war-wound infections.

10. Dosage of sulfonamide preparations to be administered.

Oberarzt (1st Lieut., MC.) Dozent SOEHRING

In consequence of the considerable differences of opinion among surgeons, no generally acceptable proposals for dosage of sulfonamide preparations may be deduced from clinical literature alone for the time being. For this reason, we are also obliged to use the results of theoretical research for this purpose. By animal test as well as by tests on cultures the growth inhibiting effect of sulfonamide derives is securely established.

The work of recent years has shown more and more that penetration of the entire vector organism is less important than achieving the highest possible concentration in the area of infection. However, in order to prevent the blood itself from becoming infected, even today one cannot forego obtaining and maintaining the highest possible blood levels of sulfonamides.

As far as the question of dosage is concerned the most important results of animal tests and culture tests are mentioned briefly. It is shown that the inhibiting substance, known since it was described by WOOD, and which also appears in the wound secreta makes the demand still more urgent that the highest possible concentration be obtained in the area of infection.

There are two ways of meeting this demand:

- a. local application,
- b. using the blood to distribute the medicine.

To a.: Practice has shown that in order to achieve sufficient concentration it is absolutely necessary to have clean conditions in the wound. Consequently this form of sulfonamide application must be performed exclusively by a surgeon and not by a physician in the field. It is necessary during every change of dressing to repeat the application in order to maintain effective concentration - which also depends on the solubility of the substances - as long as possible. It should be carried out as early as possible as then the proportion: concentration of the medicine to the number of germs is favorable.

To b. Oral therapy and injection therapy deliver only part of the dose administered to the area of infection. In these methods of administration, however, the toxic effect has to be considered more than in local application. Therefore the physician in the field has to start it. The technical possibilities are commented upon briefly.

The following dosage routine - based on the available possibilities - is recommended:

1. Three days after the injury 7.0 grams eleudron, cibazol or globucid, distributed during the day are given by mouth or as an injection, whereby a sufficient blood level is created and maintained.
2. During the first surgical wound treatment and during each change of dressing the wound is dusted thoroughly with a suitable wound powder - Marfanil-Prontalbin, cibazol, globucid - according to stock available. It is very hard to establish maximal doses for this, as at the front, resorptive or local injuries were hardly ever observed.
3. Repetition of the oral dose, or of the injection, is only necessary if definite symptoms of a generalized infection appear. It has then to be carried through energetically and with decreasing doses until the disappearance of fever. Occasional doses are of no therapeutic value.

#### Discussion:

SAUERBRUCH: Mentions the chemotherapeutic experiences during World War I. He does not mean to reject the sulfonamides but would like them to be judged with greater reservation and criticism.

SCHOERCHER: Considers the effect of tincture of iodine, rivanol or phenol-camphor as better.

BOEHLER: In the Vienna hospital for accidents formerly 3.7 per cent of disturbed wound healing occurred, since the use of sulfonamides 7 per cent.

HEUBNER: Catalytic products originate in the organism as a part of the effect of the sulfonamides.

USADEL: There is no denying that the sulfonamides have a therapeutic effect.

KRUEGER: Exact surgical treatment of the wound is decisive, but so is early prophylactic use of sulfonamides.

SCHOENBAUER: Sulfonamides are especially valuable in case of inflammations of the urinary system and in meningitis.

SCHULEMANN: The effect of sulfonamides does not depend on the species but on the milieu.



Directions for the application of sulfonamides.

Tests (GEBHARDT-FISCHER) had the following results: The development of a suppuration of the soft part caused by common pus producing germs cannot be avoided even by immediate internal and external application of sulfonamide preparations. No influence by sulfonamides on the course of inflammatory disease of anaerobic germs could be ascertained. In case of combined gas gangrene therapy the impression of a milder course under the effect of sulfonamides prevailed.

Injuries caused by sulfonamides (RANDERATH) are comparatively rare. In a direct form they appear as injuries to the liver, even acute yellow liver atrophy, as injuries to the kidneys and as agranulocytosis. For this reason the white and red blood picture should be controlled as far as this is possible under front-line conditions. Lowering of body temperature caused by attacks on the central regulation center may be considered as indirect injury which often makes it impossible to draw any final conclusions from the course of the fever curves concerning the course of wound infection. Moreover an occasional progressive deep lying wound infection may result from the local powder treatment. No direct damage of tissue has been noticed in the regions of the effectiveness of the preparations.

In the treatment of meningitis intrathecal application of sulfonamides (MUELLER) is to be rejected too, as it may lead to serious disturbances in the area of the spinal cord and to paralyses.

It has been pointed out in the clinical review that the optimistic voices have been decreasing while the critical ones have increased. The troubles mainly seen by the clinical specialist are lack of appetite and vomiting as well as increasing fatigue.

Early application in the wound area is essential for the effect. Enteric or parenteral administration of sulfonamide preparations cannot prevent the setting in of wound infection, but the course can be influenced favorably.

Thus we get the following rules for practice:

Any superficial wound, such as grazing shots, tangential shots, widegaping wounds in the soft parts are to be dusted as early as possible with sulfonamide powder. Dusting is of no use if the depth of the wound cannot be reached. To dust small wounds at the spots where the bullet entered and left the body is ineffective. Dusting of the skin is senseless and may produce eczema. In case of deeper wounds the quickest and most thorough surgical wound treatment has to be performed. In addition to this the wound may be dusted with sulfonamide powder which must reach even the deepest recesses. Powder treatment of granulating wounds is not indicated. If during the first few hours no possibility of powder treatment exists or if this does not seem sufficient it is to be replaced or completed by peroral administration



of sulfonamides. Intravenous injection cannot always be carried out under field conditions. According to the danger of infection to the wound large doses are to be used for a short period, that is 6 - 10 grams of sulfonamide during 3 - 4 days (the total not to exceed 50 grams). Small doses are usually ineffectual and therefore without influence on the course of infection and if they are given for too long a time they may have a harmful effect. Suitable preparations are preferably eleudron, cibazol and globucid. If possible the medication is to be prescribed by the field physician.

In the case of wounds in danger of gas bacillus infection - and this applied to all large and deep muscle wounds - gas gangrene serum should be given besides the local and oral use of sulfonamide. In the case of second operations, e.g. resection of the ribs, for empyema of the pleura, for secondary sutures and later amputations, the new operative wound can be dusted sufficiently with sulfonamide powder after control of the bleeding.

Under no circumstances must the thoroughness of the surgical wound treatment be less because of the additional use of sulfonamides.

For gunshot wounds of the abdomen as well sulfonamides may be used in the form of a powder (approx. one tablespoon) or an emulsion placed in the abdominal cavity.

## 11. Pathologic-anatomical bases of chronic tissue damage in case of injuries due to cold.

Oberstabsarzt (Major, MC.) Prof. STAEMMLER

### I. Changes in vessels.

a. In the demarcation area there often are endangiitic processes which 1. take place through spreading of inflammation from the adventitia to the intima and 2. spread primarily from the intima by the infiltration of plasma.

Striking "honeycombed endophlebitis" with xanthomatous fatty granulations in the veins are observed.

The disproportion between the age of the vessel changes and the time passed since the exposure to cold leads one to suppose that vessel changes may continue to develop for a long time after the exposure ceases.

b. Following exposure to cold, endangiitis of the large vascular trunks, apart from the damaged area may be present continuously or discontinuously, which corresponds to the circumstances of juvenile gangrene and may be the origin of the same.



## II. Changes in nerves.

Very frequently part of the changes in the nerves occur in a very severe form. Extensive disintegration of the medullary sheaths, in most cases also of the cylinder of the axis, with formation of fat globules and fatty granular cells, often extending far beyond the actual area of the injury due to cold.

Parallel with this there is often a very severe perineuritis and endoneuritis which in its intensity does not run parallel with the nerve disintegration but apparently depends on it.

Nerve disintegration is considered as due to anoxemia.

## III. Other tissues.

Atrophy of the epidermis with hyperkeratosis. Lesions are seen in the elastic fibers of the cutis. Vacuolar transformation of the sudoriparous glands is seen.

Severe, often focal, atrophy of the muscles (outside the necrotic area proper) with atrophic proliferation of the nuclei.

Atrophy of the bones, also outside the demarcated area proper, most likely of the SUDECK's kind of atrophy.

## Discussion:

OSTERTAG: From the collecting area of the homeland I only know such cases as were shown by STAEMMLER, which partly had died intercurrently or of which I received amputation specimens or reamputation specimens. This material is not clear enough to solve our problems. Important for late injuries, which may extend over years and decades, are the few observations which concern soldiers of the first World War (chiefly of the first few months of 1917) and the patients with injuries due to cold who have died intercurrently. Changes in vessels, lesions of nerves, injuries to muscles and damage to bones exist side by side. In the case of injuries to the muscles one must differentiate between such as are caused by direct effects of cold and such as must be considered as depending on the nerves. Such muscle degenerations, depending on the nerves, often influence only small areas and make themselves apparent as irregular degenerations of the fibers. Contrary to motor losses which are rarely observed we could demonstrate degenerations even to the retrograde degeneration seen in the anterior horn cells. Partly, the nerve decay is caused by a primary effect of cold, partly through disturbances of the nourishment of the tissue due to the edematous infiltration, partly through changes of the vessel.

The most important factors in late results of injuries due to cold are the incompletely cured i.e. incompletely restored vessels and the disturbance of the autonomous nervous system. If a vessel is completely closed by scars and a new circulation from collateral vessels is formed the danger of



extensive late injuries is far less than in case of preserved vessels with damaged walls. In case of such an incompletely recovered vessel, located in the periphery, spasms may be started by all kinds of irritations, especially of cold, and which involve the entire vascular trunk. They are to be suppressed if the part previously injured by cold e.g. the big toe, is anaesthetized. Their occurrence can be stopped by local application of vasodilating drugs.

The second danger is infection. We know that parts once injured by cold are especially subject to infections. The entire endothelial system takes part in the reaction to infections. It leads to spasms and to endarterial changes in the pathological vessels. The latter may be quite extensive within a short time. Already, four months after the injury due to cold (in the injured extremity only) endangiitic processes are also to be found.

It is generally known that the healthy animal reacts even on repeated injury by cold with a restoration of the vascular system. I know that the cold injuries in the high mountains occurred especially easily in association with infection or after use of medicaments (e.g. pyramidon).

SIEGMUND: The procurement of suitable test material is very difficult. Keener interest of the attending physicians in the scientific necessities would be desirable and cannot be enjoined on them very well. The most interesting thing in the examination of late cases is the irregular spreading of the changes in the vessels, bones and muscles, as well as, though less distinct, the changes in the nerves which are due to a degeneration. These processes are often intermittent too. Besides older changes, new ones are also seen which in my opinion are also the result of disturbances of the blood circulation and changes of tonus in vessels. They are connected with effects on the vegetative nerves, to the afferent as well as to the efferent fibers and periadventitial reticula.

SCHOPPER: Reports on late vessel injuries due to cold associated with spotted fever which occurred in the form of endangitis obliterans which causes later gangrene in the extremities, though no clinical symptoms were to be noticed before the onset of spotted fever.

STAEMMLER: Comment on the reports of OSTERTAG and SIEGMUND: The nerve changes which I have noticed spread centrally beyond the organic changes in the vessels. Endarteritis verucosa is frequently seen. In my material nerve changes are not interrupted (as contrasted with changes in vessels and bones). In injuries due to cold the infection factor plays a certain part though it is *conditio sine qua non*.

SIEGMUND: Searching for anatomically demonstrable changes by staining of neurofibrils seems to me to offer good prospects for the sympathetic ganglia as well. The undemonstrated association of infections and other secondary changes, which leads to delayed disturbances of circulation and nutrition, sometimes acts by ways of the vegetative nerve system. The injuries to the nerves are not so much a result of a direct effect of the cold as disturbances of the blood circulation caused by the cold, as can be shown by experiments. The changes in bones will be treated in detail in a treatise which is in the course of preparation.



12. Calling up for active service of men suffering from injuries due to cold.

Generalarzt (Brig. General, MC.) Prof. GOHRBRANDT

It is comparatively easy to find delayed injuries after exposure to cold. Deficient blood circulation of the skin, lowered skin temperatures, disturbances of sensitivity and function, local changes in the skin and profuse perspiration will indicate late injuries after a previous damage by cold. In doubtful cases, complicated methods of examination (oscillometry, arteriography etc.) must be used to determine the form and severity of the late injury.

The number of men suffering from injuries due to cold can only be calculated correctly if those soldiers are considered also who had previously suffered from frost-bite and were called up for active service again without any demonstrable morbid changes. Soldiers with changes in the vessels, which resemble the picture of late injuries, must not be counted among those injured by cold if they did not suffer any important injury clearly due to cold. Besides these, those whose late injuries are due to faulty amputation stumps, must not be reckoned among those suffering from injuries due to cold.

The question of how far men suffering from cold injuries may be called up for active service again is answered as follows: If after injuries due to cold certain morbid changes can still be observed, these soldiers will be called up for active service according to their physical limitations, either not at all or only in a limited capacity. Above all one has to take care that they will not suffer from a new damage due to cold again.

In the case of soldiers who have suffered from injuries due to cold and seem to show no pathological symptoms, the decision concerning their full or limited active service depends on whether or not they belong to the group of those having been injured by cold. All soldiers with disturbances of their vegetative nervous system, the so-called vegetatively stigmatized, especially the vagotonic ones, are to be considered as especially endangered by cold. After having suffered from injury due to cold once, the hazard by cold not only persists but is even increased. This is the reason why men endangered by cold should be employed only in a limited capacity, e.g. only on those fronts where no special cold temperatures are to be expected.

Most of the soldiers who suffered no permanent damage after injury by cold and who are not especially endangered by cold will become fit for active service again. Unfortunately the period for observation of the two last winter campaigns is not yet sufficient to prove this statement positively. We know that late injuries by cold may still crop up even years later. Therefore it seems appropriate for these soldiers also to not expose them to a renewed injury by cold. This is, however, only a precautionary measure.



Directions for re-calling for active service those soldiers who have suffered damage from cold.

Pathologico-anatomical bases:

The principal changes with injuries due to cold which are no longer recent are found in the blood vessels and the nerves. The vessels show changes in the demarcation area which are to be classed among the group of endarteritis and endophlebitis. It cannot be said with absolute certainty to what extent they are a result of exposure to cold, a result of subsequent infection, or of the inflammatory demarcation of the injured tissue.

It is important that following injury due to cold endangiitic processes may develop far beyond the demarcation area which are maybe either continuous or discontinuous with the changes in the vessels in the demarcation area, e.g. in the vena femoralis. Thus after an injury due to cold the parts affected by the cold, in many cases a very extensive process of decay is to be found which reaches far beyond the seriously injured area. It consists in a disintegration of the medullary sheaths combined with the formation of products of disintegration, of neutral fatty composure and of cells of fat granules with destruction of the axis-cylinder and at least a relative increase of SCHWANN's cells. The process is often combined with perineuritis and endoneuritis. The disease is considered as a result of anoxemia and could also be created experimentally. It seems to have a good prognosis and may heal up with absolute functional restoration.

Besides the diseases of the blood vessels and nerves those of the muscles (necrosis and atrophy), of the skin (atrophy, hyperkeratosis, dystrophia, of the nails) and the bones are of less importance. They are to be considered throughout as results of disturbances of the circulation.

Clinical part:

Men actually suffering from cold injuries with manifest morbid changes, no matter whether a special danger by cold can be proven or not, will not be fit for active service or at least only for limited employment according to the degree of the injuries, and must not be exposed any more to a renewed hazard due to cold. They are to be employed accordingly.

Those men, who suffered damage due to cold but no longer show any morbid changes, are particularly predisposed to cold damage, above all the so-called vegetatively stigmatized group, and they can only be employed in a limited way, e.g. in districts where no danger of damage from cold is to be expected. After an injury due to cold the danger of cold injuries which existed previously not only remains but will even be increased.



If such a danger of injury by cold by predisposition does not exist, and if no morbid changes can be proven, full fitness for active service is to be assumed. As, however, late injuries may still appear years later; the present period of observation, however, is too short to allow a final diagnosis, it is advisable to employ, when possible, those men not in danger of injury due to cold but without manifest symptoms of disease, according to the injuries suffered only as fit for limited employment, e.g. not to expose them again to the danger of cold injuries.

According to the observations and experiences up to now one must reject as incorrect the view that every one who has been exposed to or has suffered damage due to cold, is particularly liable to get a permanent injury and is therefore only fit for limited employment. If in spite of this a fitness for limited employment is assumed this is only a matter of precaution.

13. The diagnosis and treatment of pains due to gunshot injuries to nerves, along with directions.

Stabsarzt (Captain, MC.) Dozent ZUELCH

For therapeutic reasons it is necessary to subdivide gunshot injuries of the pain of gunshot injuries to nerves according to the quality of pain. Three groups of pain (mixed forms also are seen) are to be distinguished according to quality, duration and "Trigger-mechanism".

1. Group of "prickling pain" (pain paresthesias) with "tickling-prickling sensations" as in the case of a "numb foot" or as if masses of ants were walking on the skin, without interruption. Besides these, pinching-pressing or "lightning" pains which are only temporary. Location in the nervous system. Onset within a few hours or days after the injury and may last for weeks and months. Slowly decreasing. Intensification with change of weather, alleviation by diversion of the mind. Severe sleeplessness.

Treatment:

(Symptomatic) Relaxation position of the nerves. Avoiding of mechanical irritation of the wound through massage or medico-mechanical treatment! Strong susceptibility to cold even in summer - gloves! Analgesics less effective, caution against morphine on account of habit formation. During the first weeks, large doses of vitamin B<sub>1</sub> seem especially effective (30 - 40 cubic centimeters/ in 20 injections). With vaccineurin-treatment (12 injections in 6 weeks) success has been noticed too. Operations on nerves ineffective.

2. Group of the "burning" pains of causalgia. Typically appears as in the case of medianus and ischiatico-tibialis nerves and corresponding multiple injuries. Location in the

peripheral parts of the limbs, principally on the volar sides. Begins a few hours or days after the injury, lasts for months and years, starts and increases by startling and irritating impressions of the organs of sense: eye, ear, touch. Onset of pains in the hypersensitive dry skin of the involved limb, in the opposite side or in the entire body. Caution against the diagnosis "hysteria or simulation"!

#### Treatment:

Symptomatic relief through relaxed position of the nerves, effect of moist coolness upon the involved extremity or the opposite extremity, mental diversion. Avoiding any effect of heat (sweat box, heat pad). Specific treatment by alternating baths (1 minute cold, 3 minutes hot for 30 minutes, 2 - 3 times daily) of the injured extremities or opposite extremities. With insulin cures (20 injections of 20 - 50 units with 3 hours effect within three weeks; caution against hypoglycemia, trained personnel necessary).

In severe cases and failure of conservative treatment first of all a novocain blockade at the place of injury is to be considered. If it is effective, an operation on the nerves is advisable. If this treatment fails, a temporary blockade of the sympathetic or its permanent disconnection by alcohol injection or operation is to be considered.

3. Group of "cutting, darting" permanent pains of severe intensity through compression of the nerves with aneurysm pressure or strong formation of scars. Corresponding surgical measures. In contrast to the usual indication in case of intervention with the nerves, early operation before expiration of the first 6 months.

#### Discussion:

CORDEL: Neuritides in nerves injured by gunshots are recognized by pressure pain above the place of injury up to the area of the plexus.



14. The operative treatment of peripheral nerve injuries due to gunshots.

Oberstarzt (Colonel, MC.) Prof. TOENNIS

Directions:

The following time limits, which were arrived at by observation of the spontaneous restitution of aseptically healed nerve gunshot injuries, form a basis for the indication to operate as well as for the determination of the moment favorable for the operation.

Location of Injury	Space of Time	Average Onset of Recovery.
A. <u>Plexus brachialis</u> , at any height of the plexus.	$\frac{1}{2}$ - 10 months	10 months
B. <u>N. radialis</u> in the upper arm, in the forearm.	$\frac{1}{2}$ - 6 months $2\frac{1}{2}$ - 4 months	6 months 3 months
C. <u>N. medianus</u> in the upper arm, in the forearm.	$\frac{3}{4}$ - 7 months $1\frac{1}{2}$ - 3 months	7 months 3 months
D. <u>N. ulnaris</u> in the upper arm, in the forearm.	$1\frac{1}{2}$ - 6 months 1 - 4 months	6 months 4 months
E. <u>N. ischiaticus</u> gluteal area, upper third of thigh, middle third of thigh, lower third of thigh, knee area, leg area.	1 - 12 months $2\frac{1}{4}$ - 12 months $1\frac{1}{2}$ - 8 months 1 - $6\frac{1}{2}$ months $1\frac{1}{2}$ - 5 months $1\frac{1}{2}$ - $5\frac{1}{2}$ months	12 months 10 months 8 months 6 months 5 months 4 months

If, until the average time of onset of recovery of a nerve, no symptoms of a returning motor function have appeared, an immediate operation should be performed. If before this moment motor functions reappear, there is no reason for an operation if a steady improvement is observed. If, however, a delay in the beginning of the function of the individual muscles takes place, and that without any other traceable cause, such as neuritis and intercurrent diseases, the place of injury in the nerve should be laid open. A positive failure for the HOFMANN tapping test shows a certain probability of the onset of motor restitution.

Failures in nerve suture are a result of bad adaption of the nerve ends, partly or complete bursting of the suture by increased tension as a result of involuntary brusque movements during the period of after-treatment. This is the reason why after operation the limbs must be put in a resting position by means of a plaster of Paris cast, in case of stronger tension on the nerve for at least 6 weeks. After this the extreme position of joints is relinquished step by step but continuously held firmly in the new position by a splint which keeps it in a quiet position. After 8 - 10 weeks one may begin with cautious passive movements. For injured nerves in the leg a bed rest for  $3\frac{1}{2}$  to 4 months is necessary. The rest of the treatment corresponds to that adopted before the operation.

The degree of success depends on the careful carrying out of the after-treatment.

15. Limits of the therapeutic evaluation in the X-ray picture of peripheral nerve injuries shown by contrast methods.

Stabsarzt (Captain, MC.) BRUNNER

The showing of injured peripheral nerves in the X-ray picture is recommended:

1. In all cases where, in connection with first operative care, a disturbance in the healing of the nerve cables may be assumed after 3 - 4 months by non-appearance of the HOFMANN tapping phenomenon. In this way reappearing failures of healing are recognized with absolute certainty and taken care of by secondary operation without much loss of time.
2. In cases where, before the first operative care, the site of the nerve injuries cannot be determined through the clinical picture with its numerous scars, the X-ray picture with many metal fragments, the neurological test (thigh-ischiadicus, upper arm-ulnaris-medianus-radialis) will permit the accurate determination of the site of interruption so that the operation field may be restricted and an indiscriminate extensive exposure of the nerves can be avoided.

The use of Vasoselectan yields much better results than Torotrast. It is resorbed in a short time (14 days to 3 weeks) secreted chiefly through the kidney. If necessary one may begin with the operative care of the injured nerve, eliminating any irritation by a foreign body, soon after its use.



16. Plastic operations in case of nerve paralysis.

SS-Gruppenfuehrer (Lt. Gen., Elite-Guard)  
Prof. GEBHARDT and J. KOESTER

The following recommendations are made for a successful performance of a plastic operation for treatment of nerve paralyses:

1. Creating a passive support of the joint by extended tenodesis,
2. Active strengthening by conservative transplanation of muscles,
3. Supporting silk-rein plastics which supply additional strength from the still operating chain of links,
4. Strengthening by muscular neurotization: Attention must be paid to:
  - a. Creation of broad areas of contact;
  - b. Control of hemorrhages by transferring anatomically limited muscle parts, avoiding surfaces of incision in the muscle tissues which are in danger of hemorrhage and later formation of obstructions by scars;
  - c. Removal of the muscle fasciae in contact with paralysed and non-paralysed muscles, as they too hinder the growing across of nerves;
  - d. Decrease of irritation by foreign body within the area of contact by avoiding supporting sutures between the two muscles;
  - e. Bony, or periosteal anchoring of the donor, which through this besides becoming a neurotiseur also becomes an active support.

III.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON DERMATOLOGY

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Translation prepared by:

Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section



Treatment of infectious dermatoses with sulfonamides  
(See Section II, Article 8)

Calling up for active service of men who have suffered  
from injuries due to cold  
(See Section II, Article 12)

Pathological anatomy of injuries due to Salvarsan  
(See Section VIII, Article 2)

Pathology of injuries due to immunizations  
(See Section VIII, Article 3)

1. Judgement of fitness for active service of psoriatics.

Oberfeldarzt (Lt. Colonel, MC.) VOHWINKEL

Well-known specialists maintain the point of view that no psoriatics should be in the Army. If, however, no psoriatics were drafted into the 100 000 man Army because sufficient thoroughly healthy young men were available, it goes without saying that this had to be changed with the introduction of universal (compulsory) military service. Psoriasis frequently appears for the first time during the period of puberty and early manhood, men are more often affected by it than women. Often it is the especially strong young men who are affected, who are in other respects completely fit for military service.

One must not forget either that a skin-disease very often changes its aspect through a change of environment. Psoriasis certainly is a disease whose origin and cure are influenced by climatic factors, above all by light and air. ROLLIER once called attention to the fact that psoriatics are free from symptoms as long as they expose themselves freely to the sun and by this acquire a dark-pigmented skin. We also know that ultraviolet light rays are a good remedy for psoriasis. In hardly any civilian occupation will light and air produce such an abundant effect, especially during the summer months as is the case in the Labor Service and Army. This may have the result that symptoms of the disease show a different form with some soldiers.

A number of newly enlisted soldiers attacked by psoriasis who were transferred immediately to my department were kept under observation by myself for about one year. It proved that the majority had no or only unimportant recurrences or easy to cope with by the physician in the field. Quite exceptionally soldiers in their first year of service had to be confined to a hospital a second time for 2 - 3 weeks to be treated for a relapse of psoriasis.

There are of course severe and very severe cases of psoriasis, which do not permit military service. Among these are, especially psoriasis arthropathica, quite extensive forms of psoriasis which often relapse as shown by their history, and cases of psoriasis inversa which are often particularly malignant and may lead to secondary



erythrodermias. These diseases must be classified by the examining physician from the beginning according to L 3, or U 3, or U 62. As for the remaining cases it would be wrong to deprive young men with lighter forms of psoriasis of the education and training by the Army, especially as psoriatics are often particularly strong men in other respects in excellent condition of health. In many cases one even has the impression that military service is only of advantage to this skin disease.

If one has worked in large hospitals during this war or inspected dermatology departments it could generally not be noticed, certainly not in France, that psoriatics with lighter symptoms were hospitalized for any considerable time.

As a rule the lighter cases were always sent back for treatment to the troop physician. On the other hand the severe cases were treated on the wards - there is no other possibility. In my department in Paris, 241 psoriatics with severe skin-disease were treated in one year. The average period of treatment was 30 days. These figures indicate that without exception, severe cases were treated. My inquiries with physicians who manage large dermatology departments in the West showed that of recent date hospitalization requests from the field physicians were made according to regulations. In spite of this it will happen now and then that patients are admitted whose treatment could have been taken over by the field physician, or whose symptoms are of such minor importance that they will need no therapy at all. This should be avoided, as at present every man is needed by the Army. It is an important task of the field physician to do everything, in order to maintain the fitness for military service of his men and thus the Army's readiness for action. During the inspection of defense posts and advanced bases in my section of service I often examined the state of health and the general hygienic conditions of the soldiers. Thereby it could be observed that naturally there is always a number of cases of psoriatics in which neither the patient nor the physician pay any attention to the symptoms of the disease, because they are not very extensive. On the other hand also such cases were noticed which after all showed fairly severe changes of the skin and should not have been left untreated for aesthetic reasons on account of the close living conditions of soldiers. In these cases it must be decided whether the troop physician should not undertake treatment with prescriptions which do not molest the patient or which do not damage the laundry to any extent. In some cases this may be quite possible, even maintaining the fitness for active service of the patient.

I was informed of two striking cases: Both of them were men from 28 to 32 years of age. For years they have been known at a university clinic for diseases of the skin as particularly severe psoriatics, resisting any therapy, but, in spite of this they were drafted. Both were workers from the armament industry and both had to be discharged from military service after about 4 months, after staying in hospitals nearly the entire time. The severe aggravation



in the beginning of their service with the Army was certainly to be traced back in both cases to the fact that they could not care for their skin regularly with baths and ointments. They had been in a position to do this during their civilian life and had been able to perform their job. Thus, however, they were of no use either to the Army or to the armament industry. Perhaps it would be advisable with psoriatics, if no lighter forms are involved, to take expert opinion about them at the clinic or hospital where they are known. The judgement of such institutions which has to be given most conscientiously and to the best of their knowledge, might in such cases be considered more when they are drafted.

The classification chart gives instructions under number 3 how skin diseases are to be judged. No doubt can exist after the before-mentioned that all columns of this number are applicable for the treatment of psoriasis, according to the seriousness of the disease and its tendency to relapses. According to column 6 "chronic and contagious skin diseases of such forms that they provoke loathing" belong to the class "unfit for service". The two before-mentioned cases are such. Psoriatics of this type are absolutely unfit for active service.

#### Directions:

Light cases of psoriasis either need no treatment at all, or they should be treated by the field physician. By this, fitness for active service is maintained.

Medium and severe cases are to be sent to a hospital, because it is only there that the installations for appropriate therapy to obtain a quick restoration of the patient's fitness for active service are available.

The most severe cases such as psoriasis arthropathica, psoriasis inversa and most extensive cases which show a history of frequent recurrences are usually unfit for service. They have to be classified as L 3 or U 3 or U 62. At the first military medical examination inquiries at hospitals in which psoriatics were often treated are of value in some cases before the first medical evaluation is given.

## 2. Experiences gained in the treatment of lues.

### Together with directions:

Oberstabsarzt (Major, MC.) Prof. SCHREUS

The new instructions for the treatment of lues were the chief subject under discussion. On the whole they correspond with the experiences as well as with the measures demanded by active conditions, as far as they demand a departure from peace time routine.



The following points were fully discussed:

1. The course of treatment for a cure generally demands no departure from peace time routine. No change in usual practice should be made. In cases of strong constitution and normal organic conditions 0.6 grams of Neosalvarsan or Natriumsalvarsan may be injected twice a week or every 5th day. It is, however, to be pointed out that a decreased dose to be graded individually, must be prescribed by the physician, if the general physical condition of the patient or the findings in single organs indicate this. In decreasing the doses and the resultant weakening of the effects of the cure it must be considered that an inadequate treatment may have serious consequences for the patient. Under no circumstances is it allowed, for reasons of energetic lues treatment, to expose the public to a dangerous risk caused by war as by intensive but inadequate treatment the danger of contagious recurrences and a spreading of the disease may result.

2. From these points of view the increase of intervals between the single injections has to be judged too, which is in itself indicated with every appearance of intolerance. The total lengthening of the cure thus caused, which generally is not in the interest of the Army, must be considered too.

3. Technique: The dissolving of Salvarsan is to be performed with the greatest care and separately for each single injection. The tendency of Salvarsan to oxidize and the resultant increase of toxicity must be considered. The cleanliness of the containers and the syringes for dissolving the Salvarsan, especially that residues from previous injections are not present, must be watched over constantly. When an injection is made it must always be considered that a different medicament is injected. Pharmacologists consider it as dangerous to use less than about 7 cubic centimeters sterile aqua (twice distilled) for dissolving Salvarsan. It is not advisable to use additional substances in the dissolving medium (glucose, calcium compounds, cebion). If one wants to administer such substances they should be given separately from Salvarsan. The injection has to be made slowly (at least 1 minute). Paravenous injections have to be absolutely avoided. The injections are to be made with the patient in a reclining position.

4. General points of view: A careful questioning and examination of the patient is necessary before the beginning of the treatment and during the treatment before every injection. The latter examination is to be made with stripped upper part of the body. One must especially watch for exanthema and purpura. The mucous membranes of the mouth and throat are to be examined too. One always should inquire how the patient tolerated the last injection, especially whether fever or chills were noticed. Before every injection the urine has to be examined for albumen, if the diagnosis is positive for sediment and once a week for urobilin. In case of the slightest suspicious symptoms a specialist's advice must be asked for before a continuation of the treatment, in order that, according to circumstances, more detailed examinations (blood-picture) may be made. In



areas with accumulated appearance of hepatitis epidemica special attention is to be paid to the function of the liver.

5. As regards the total number of courses it is recommended to give 2 "safety" courses after disappearance of the clinical symptoms. If the seroreactions do not become negative it is generally to be recommended that a specialist's advice be requested about the amount of the dose to be given.

6. Cases in which Salvarsan cannot be used, because the patient cannot stand it, are to be treated in the same way.

7. If it may be supposed in consideration of the clinical findings, the treatment history and the spinal fluid test, that the patient received an adequate treatment, it may generally be assumed after 2 years at the earliest following careful observation that the disease is cured and permission for marriage can be given. Only in exceptional cases and after consulting a specialist should this period be shortened.

8. The further application of complement fixation reactions is also desirable. On account of the difficult decision concerning the amount of treatment and the evaluation of the cure, one cannot eliminate their use. It is therefore proposed, apart from the present existing regulations concerning the use of sero reactions, to make it possible for the WASSERMANN examination of the serum to be performed, at least if requested.

3. Experiences in the treatment of lues based on the new instructions, injuries caused by Salvarsan, deaths, etc.

Oberfeldarzt (Lt. Colonel, MC.) Prof. GOTTRON

There are two reasons why lues treatment is discussed anew, the one is, because lues itself is increasing and the other, because of an increase of the often fatal injuries caused by Salvarsan. Fatal cases due to drug and therapeutic action during a stage of disease like lues I and II are always alarming. The importance of injuries caused by Salvarsan as regards their frequency is evident in comparison with the fatal cases during narcosis, after chloroform which appear in 1:2500, while fatal cases due to Salvarsan in one field hospital were observed 1:100 in another as 1:730, of the treated lues patients. However, in the dermatology clinic of Breslau University only one fatal case among 1400 treated lues patients was observed during the last years. Salvarsan dermatitis, acute yellow liver atrophy, agranulocytosis and panmyelophthisis as well as purpura cerebri are the diseases with fatal result. At present the proportion of these diseases is quite different from that during the



period after the first World War. During that time fatal cases of Salvarsan dermatitis were predominant while at present it is purpura cerebri, agranulocytosis and panmyelophthisis. This becomes understandable by the fact that physicians learned to avoid severe Salvarsan dermatitis and to treat an early case, and also to diagnose and estimate correctly the warning symptoms of the development of a Salvarsan dermatitis with exception of paravenous infiltrations which are found in 42 per cent of the Salvarsan dermatitis patients. The possibility of the appearance of liver injury is also taken into consideration by physicians more than before, so that for this reason injuries to the liver with fatal result caused by Salvarsan treatment have become more rare. This is surprising, since injuries to the parenchymal liver due to many infections and not least of all by hepatitis epidemica, are rather frequent and thus the danger of an injury to the liver during the Salvarsan treatment is increased. On the other hand it is to be considered that the food conditions in the Armed Forces are more favorable than during the first World War and the inflation period; therefore the more serious effects are avoided. Injuries to the blood-building apparatus and the purpura cerebri are the predominant symptoms. The first of these may be limited by observation of the skin for hemorrhages before each injection of Salvarsan and by examination of the blood-picture to be made afterwards. If the blood picture is not examined before every injection, which is not practical, hardly any warning symptoms of agranulocytosis will be detected. Purpura cerebri may be limited by treating hemorrhagic secondary exanthmata adequately with bismuth, before the application of Salvarsan, and by considering that the Salvarsan itself widens the stream tract, slows down the stream, and so produces those conditions of circulation on which purpura cerebri depends. This progress gradually results first in a brain edema and only afterwards in a purpura which, however, sometimes does not fully develop. Previous infectious diseases developing into the above-mentioned conditions of the circulation should cause one to be cautious in the use of Salvarsan. From all this it may be seen that it is not lues which is to be treated but the lues patient, and that greater consideration should be given to the individual treatment of the lues patient. Lues I and II are not fatal, but not seldom the patient dies from the treatment of them. Injuries caused by bismuth which are fatal only in exceptional cases are mentioned. For the undesirable occurrences in connection with lues treatment, technique is more responsible than the remedy.



4. Chemo-resistant gonorrheas.

Stabsarzt (Captain, MC.) Prof. FELKE

As a superficial infectious disease, gonorrhea, on account of its accessibility, permits an excellent observation of the processes of chemotherapy. Of the relations between the three factors, organism, germ and sulfonamide, those between germ and sulfonamide are always considered as more measurable, in corroboration of the work of FELKE. According to this the majority of chemo-therapeutic failures shows gonorrhea strains which are resistant to sulfonamides in the culture as well. These organisms retain their characteristics in corpore and in vitro when transplanted to new culture mediums and partners (confirmed by HAGERMANN, VONKENNEL, KIMMIG).

Thus the danger exists that the susceptible strains disappear more and more, while the resistant ones increase in percentage. Consistent with this is that in the East the gonorrhea treatment has fewer chemotherapeutic failures than in the West where general chemotherapy has been applied already for some years. This clinical observation urgently needs experimental study by tests of the strains.

It must be demanded that in the treatment sulfonamides should be used in doses as strong as possible and that the greatest attention should be paid to the cure of female sources of infection.

If chemo-therapy fails the best effect seems to be obtained by fever therapy beginning from the 4th week of infection with 40 per cent Olobintin or Pyrifer and then in combination with an intensive additional sulfonamide course. Besides this the classical but mild local treatment is necessary.

5. Concerning the fitness for active service of men suffering from damage due to cold.

Oberfeldarzt (Lt. Colonel, MC.) Prof. E. HOFMANN

During the second Russian winter the troops were living under different conditions than during the first Russian winter owing to the change of humidity during the day and cold during the night.

Medical care must provide against this. The complaints remaining after injuries due to cold are only partly based on objective findings: Capillary dysfunction, sweaty feet, sclerosis. The conditions of blood circulation of the injured extremity may be worse than normal for weeks and months.

Consideration is to be given to the possibility of late injuries, and under certain circumstances attention is to be paid to SUDEK's bone atrophy. It goes without saying that such persons must be treated particularly careful during their later service.

The care for the reemployment of men suffering from cold damages must be left principally to the replacement unit.

Information and detailed instructions by the field commanders and the field physicians are always urgently needed even before the beginning of the dangerous season.

The soldier must know how injuries due to cold are caused. He must find understanding for his needs with the non-commissioned officers, clothing, boots and shoes must be handed out according to the needs, sufficient socks for changing, boots should be large enough so that two pairs of socks can be put on.

Special attention is to be paid, however, again and again to the treatment in due time of sweaty feet not only in consideration of the perspiring of the foot in summer, but as prophylaxis against new injuries due to cold during the winter.

At the replacement unit medical evaluation is necessary to determine whether the soldier is still fit to do infantry service or whether he has to be transferred to another arm of service. It would be harmful, however, if at the replacement unit or at the front field unit too much would be said of men suffering from injuries due to cold, and if a soldier became aware of a possibility to overevaluate the disease he experienced. While one can notice that the soldier in the front line in action is inclined to underestimate beginning cold injuries, one can observe later on that he frequently emphasizes his complaints.

Here the correct psychological care for the soldier is necessary at the replacement unit.

If all precautionary measures are taken it is obviously not necessary to withdraw the majority of the men suffering from slight frost-bite from the service at the Eastern front.

It is necessary to carry out all the necessary hygienic measures for those suffering from frost-bite, as well as for the new-comer on all sectors of the front.



IV.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON FORENSIC MEDICINE

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Translation prepared by:

Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section

(Summary)

In the Army the consultants on forensic medicine have not yet been fully organized. Thus for the present it was less important during the conference to speak about results and to frame directives. It seems more advisable to check the instructions given in the service regulations for the consultant forensic physicians and the manual on the evaluation of self-mutilation with the experiences made so far, which was used as a basis of discussion at the previous conference.

In this sense the reports of the two first forensic medical consulting physicians active in the operation sector Oberstabsarzt (Major, MC.) Prof. MUELLER and Stabsarzt (Captain, MC.) Prof. BUHTZ on their experiences were fully discussed. It proved that the employment of forensic physicians was warmly welcomed notably by the army administration of justice, but also by the medical corps, and especially by the pathologists who have been particularly overworked until now. The demarcation of activity, especially against that of the pathologists, has been successful. The field physician and the troops must still become more used to consulting the forensic physicians. In the future this will be favored in a desirable way by the order of the Army Surgeon-General of 7 May 1943 to the effect that forensic autopsies are to be made only by consultant forensic physicians or pathologists.

Among the results of the previous employment of forensic medical specialists the well-known examinations by BUHTZ in the forest of Katyn must be particularly mentioned. These are especially binding for us scientifically in order of the echo they found in the homeland as well as in foreign countries and especially by the collaboration with forensic physicians of friendly and neutral countries.

For a further planning of action the number of individuals required for filling the existing positions had to be named from the circle of forensic physicians with the cooperation of the president of the German Society for Forensic Medicine and Criminal Affairs. In this great difficulties had to be overcome, because the needs of academic work and of experts, activity in the civilian sector had to be considered in each individual case.

As regards single special fields Oberstabsarzt (Major, MC.) MUELLER dealt with the microscopic diagnosis of short range gunshots. He far surpassed the old inadequate examination of excised preparations for powder ingredients with a new method, that is the microscopic examination of thin strips of epidermis from smoke suspicious areas. The method is introduced as an additional examination medium besides other optical methods and besides microchemical methods.

In a lecture on self-mutilation with chemical means, PLANNING mentions that some new observations of self-mutilation by injection of petroleum and by application of various stimulants to the skin have been reported. Prof.



SCHMIDT, Danzig, was able to contribute the experience that petroleum in the tissue could not only be proven by distillation when newly applied but also in ulcers which were some weeks old.

The lectures of HALLERMANN linked the problems of the consultants' group with the theme proper of the conference: The right to support in case of sudden death. HALLERMANN based his lecture on the well-known classification of cases of sudden death into:

- A. such as are explained principally by an undetected primary disease;
- B. such ones in which the probable causes of death are factors of constitution and disposition and
- C. cases for which the cause of death is not ascertained even by autopsy by a specialist.

In cases of sudden death the following view-points were underlined by him as important directions for clarifying the questions of the causes and the acknowledgement of an injury received in service.

For the A cases causality is to be answered in the affirmative, if fundamental conditions based on the peculiarity of army service contributed essentially to and caused the fatal result of the primary disease. A connection is to be denied if death would have resulted by progress of the primary disease by Divine dispensation and if only conditions irrelevant to the law, variable and accidental, were responsible for death in the given period.

For B-cases the external or internal accidental causes are often responsible for death. Causality is to be recognized if a fundamental accidental cause or a temporary disposition is to be traced back to army influence.

In C-cases often the imperfection of our knowledge has to be considered in favor of the person entitled to support. In case of sudden death anatomically uncertain injuries received in service are to be recognized if the possibility of a harmful effect of army service influences is not precluded by clear signs.

Special attention is called to the fact that a judging of the degree of causal influence is to be determined according to the conditions of the individual case and not by its effect on a thoroughly healthy person.

V.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON  
OTORHINOLARYNGOLOGY

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Translation prepared by:

Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section



Effects of sulfonamides;  
(See Section II, Articles 5 - 10)

Late results after commotio and contusio cerebri.  
(See Section XI, Article 7)

1. The treatment of gunshot wounds of the jaw and face  
by plate-wire method.

Professor PERWITZSCHKY

Opinions still differ about an appropriate treatment of injuries to the face. On the whole the following three principal groups may be distinguished:

1. The conservative method of treatment, in which the wounds are first made to heal with supporting bandages. Later on the remaining defects are covered with plastic operation. 2. The wounds are stitched after trimming of the wound edges. 3. Each wound is sutured in the stage of granulation (early suture, GANZER).

In the beginning of the Eastern campaign I first adopted the method mentioned first in my department of jaw surgery and facial surgery. As a routine method it did not satisfy me, especially in those cases in which the mouth cavity was opened up. Until the time when plastics could be made sometimes months passed - owing to jaw corrections - which meant torture for the patient. The saliva flowing through the defect in the mouth was distressing for the wounded men, it moistened the bandages and soiled the laundry and uniforms. Consumption of food was hampered and was disgusting, speed was disturbed and hard to understand. Although plastics made later yielded satisfactory cosmetic results, the functional results, however, left much to be desired. For this reason I tried to close the wounds in the stage of granulation. Silk and catgut proved unsuitable as suture material, since the sutures were cut through too easily and suppurations of the puncture-channel set in. For this reason I used the wire introduced for plastic operations already in surgery by MIKULICZ and inserted plates which allowed strong tightening and did not cut through. While in the beginning I only selected cases which seemed suitable to me on the strength of my experiences gathered in the meantime, I undertook to stitch all wounds in the face without regard to their condition and size. Possessing now experiences of 250 unselected cases and considering the satisfactory results, I demand that all wounds be closed promptly by the plate-wire method, because in no single case I obliged to remove the suture on account of a beginning infection.

Now, as it turned out later, this method of wound treatment was adopted already during World War I by GANZER who called it "early suture".

The technique is very simple: Only badly soiled wounds are rinsed out with a solution of camomile, and occasionally necrotic shreds are cautiously removed. Bone particles are only removed if they are loosely lodged in the tissue and are no longer connected with the tissue. Considering the remarkable capacity of regeneration of the lower jaw-bone any unnecessary removal of bone parts might hamper spontaneous consolidation by damaging the periosteal bone. I employ the so-called mattress-suture with aluminum-bronze wire 0.5 millimeters thick and put RANDOLF-plates at the places of suture, in order to prevent a cutting through. A dry bandage is used. If later on the sutures became loose by decreasing swelling of the tissue, the wire suture is tightened. The wires are only removed when the wound is healed securely and thoroughly.

The success with early suture is invariably satisfactory without regard to the time passed since the injury was incurred. The advantages over the conservative method of treatment are especially striking. Early suture shortens the length of treatment considerably, produces an early endurable condition for the wounded man and saves him the other plastic operations necessary for covering up the defect.

A large number of gentlemen who have visited my department for jaw surgery and facial surgery had an opportunity to convince themselves that in addition to the good cosmetic results, the functional results were excellent as well, because the defect is closed up by local tissue by the early suture while in case of secondary plastics - apart from the size of the operation or operations - the plastic flap has a considerable disadvantage which is especially apparent functionally.

(Showing of diapositives).

In a few cases which were sent to my department already in a cicatrized stage I freshened up the edges of the defect with the sharp currette, if there was sufficient material for covering up and applied the plate-wire suture.

Moreover, I use wire suture as tension sutures, as probably all plastic surgeons do, in order to isolate the tension of the wounds closed by approximation sutures away from these sutures, especially if this tension makes one apprehend that a cutting through of the stitches may result by active muscle movements. For plastics of the nose a form for the transplant may also be obtained by applying wire plates.

Recently WASMUND described wire suture as a counter-sunk suture in order to avoid the scars of the puncture channel which occasionally appear in connection with the plate-wire method.



### Discussion:

GREIFENSTEIN - Koenigsberg: The combination of sutures for facial wounds should be used more frequently in every stage though with more selection - than is done at present. It is not advisable, e.g. in the case of deeply located necroses whose removal often takes a long time.

The mucous membrane of opened up accessory sinuses, which is more or less changed by inflammation, must always be removed too after creating a wide connection to the nose, if one suspects fracture of the rear bony wall.

HAMMER - Berlin: It is pointed out that the opinion advocated again and again even before this war in writing and verbally by facial surgeons and jaw surgeons, especially by Prof. AXHAUSEN that operative wound treatment for newly injured men of our district is the method of choice. The time limit of first aid may be extended in suitable cases to the 8th or 9th day. According to our experience no active measures are advisable in the stage of granulation. It is recommended to bring the gaping wound margins closer together by means of adhesive tape, to treat the wound carefully and to watch for complications. Adhesive tape was quite sufficient for bringing the wound margins together. For this purpose we did not need wire suture. For later treatment one must discriminate between scar plastics and defect plastics. In any case we do not regard freshening up of the wound margins by scraping off with the sharp curette as suitable, since by this the required splitting of the wound layers cannot be obtained, the functional and cosmetrical disturbance of the scars cannot be removed, and the accurate surface of incision, necessary to obtain cosmetically satisfactory scars, cannot be achieved. As material for sutures in plastic operations we need wire suture to relieve the tension and limit it to the cases in which it is required. For exact adaption of the wound margins in plastic operations in the facial area thin silk suture seems more appropriate than the RANDOLF-wire 0.5 millimeters thick which is used by the speaker.

## 2. Gunshot wounds in the larynx, stenoses of the larynx and their treatment.

Stabsarzt (Captain, MC.) Prof. GREIFENSTEIN

This description of gunshot wounds in the larynx and their most frequent and most serious result, difficulty of breathing due to stenosis of the air passage, is based on the experiences of the special department of a general hospital in the home territory with approximately 100 such cases.



During the first few weeks of the Eastern campaign a considerable number of fresh larynx injuries, one or two days old, were conveyed to us for treatment by air transport, so that we may define our attitude regarding the question of the most appropriate early treatment, not only epicritically, but from our own practical experience too. Everywhere practical clinical and therapeutic points of view should be predominant, while the discussion of several theoretical questions, as well as the statistical evaluation of our observation material and the results of treatment must be left to be dealt with later on. Renouncing any claim to completeness, my chief aims are 1. to survey of gunshot injuries in the larynx, their consequences and the valid principles of treatment, 2. to underline observations differing from the experiences of the World War I, 3. to emphasize known facts which are often disregarded and 4. to make diagnostic and therapeutic suggestions which I could not find at all in the literature on the subject. Compared to other organic injuries or even with injuries to the extremities, gunshot injuries in the larynx are rare incidents. Without doubt they have to be considered as serious injuries to which a large number of wounded succumb right on the battle field either by suffocation or bleeding to death and especially by aspiration of blood. In spite of the existence of numerous statistics it is difficult to obtain a clear concept of the fate of men wounded in the throat or larynx because of the variety of the material on which the findings were based. In the present era of air transport there is certainly no justification anymore for the concept stated more than once in literature of World War I that only prognostically favorable gunshots in the larynx reach the base hospitals.

Every larynx or trachea injury must be considered as part of a more or less serious throat injury. The crowding of the most important organs in the narrow space of the throat makes it clear that an injury to the larynx is sometimes of less importance than the accompanying injuries to the vessels, the oesophagus, the cervical vertebrae and the spine. Under field conditions the accompanying injuries mentioned are therefore the most important, because they urgently require treatment. It is only later on, often only in the special departments of war hospitals and base hospitals, that the question of kind and size of a gunshot injury to the larynx becomes of greater interest. The exceptional position of a gunshot injury to the larynx is based upon the fact that it is not really an injury to an organ which has to be dealt with, but one of a complicated articulated mechanism which may have serious **results for breathing** and speaking. The importance of more serious injuries to the larynx is especially clear if one considers them with HOFFMEISTER as a special kind of complicated fracture, the healing of which is often aggravated by the appearance of an infection. For weeks the treatment of serious injuries to the larynx is accompanied by the danger of perichondritis and other complications resulting from them. The close anatomical and functional relations to the oesophagus later on causes the danger of aspiration, which is especially great during the first few days if internal hemorrhages set in, but later on too, as long as a cannula



must be worn. Finally, even after the anatomical healing of the injuries to the larynx serious changes of form and disturbances of function remain in a not inconsiderable percentage of the cases, which require after-treatment for months and even years, in order to restore free breathing and a useable voice. Unfortunately in some cases this aim cannot be achieved so that the injured men remain permanent wearers of cannulas.

In some cases the recognition of an injury to the larynx is very easy, in other cases, however, it may become very difficult and without specialists' devices impossible. It is certain at the first glance if the injured cartilage frame or the opened up lumen can be observed in the wound. Although the other classical symptoms of an injury to the larynx such as dyspnoea, vocal disturbances, difficulties of swallowing, coughing up of light-red blood, as well as emphysema vary and are only rarely completely absent, they cannot be considered as positive proof. Even if several symptoms appear together they remain ambiguous and may be caused in the same way by an injury to the pharynx or the esophagus, by indirect participation of the larynx by haematomata and edema, by vagus-recurrent nerve paralysis or by an injury to the pleural-apex of the lung (emphysema). A positive hemoptysis proves an injury to the mucous membrane and increased danger of infection by this, though not positively the perforating character of the gunshot. These fundamental statements make it clear that in many cases of injuries to the lower part of the throat it is impossible to make an accurate diagnosis of the location of the injury with the medical units at the front and accordingly the treatment there must be and may be a more symptomatic one, chiefly concerned with relief of dyspnoea and control of hemorrhage. The extensive information which may be gained by laryngoscopic and X-ray examinations justify the demand that the patient should be conveyed to a specialist's department as quickly as possible, an opinion which, I am glad to find, is also stated plainly by FRANZ in his manual of war surgery. It is certain that the most convenient way of transport is by air, which at the beginning of the Eastern campaign brought a large number of men injured in the throat or larynx to us for treatment even on the day after they were injured. No serious objections are to be raised against the transporting of the tracheotomized patient, provided that they are in good general condition of health and if there are no other serious injuries. Moreover, the accompanying personnel must be able to clean the inner tube of the cannula with reliability. As far as the condition of the injured man allows it, it is advisable to begin on the day on which the tracheotomy was performed to make him familiar with the manipulations for a removal and cleaning of the inner tube of his cannula.

Contradictory to the statements in the text books, the previous history of throat or larynx casualties contains only very rarely any statements about unconsciousness or severe shock. Sometimes immediately after the injury was suffered surprisingly heavy and prolonged physical exertion was accomplished. It is out of the question that,



as is stated in a well-known handbook, the wounded man in case of gunshots in the soft parts of the throat nearly always collapses and becomes unconscious (STAHL).

It is of the greatest importance for the first clinical diagnosis of a gunshot injury to the throat to determine the direction of the shot channel. Even less than in other areas of the body, this falls together in the throat with the line connecting the spot where the bullet entered and the spot where it left, or where the bullet is lodged in the affected part. During the return from the "injured position" to the "normal position" (KILLIAN) in which we examine the injured man a change of the course of the shot channel takes place too by a lateral shifting (WILDEGANS) of the organs of the throat and soft parts towards each other. The thorough examinations into this question made by KILLIAN during World War I cleared up many unaccountable cases easily and convincingly: cases which on the one hand, according to the position of the spot where the bullet entered and that where it left, should have been combined with injuries of the deeper organs of the throat, but where this was not so; on the other hand apparently harmless superficial gunshots passing right through in which attention was attracted only to serious deeper injuries by the appearance of complications. One always has to realize this uncertainty in the diagnosis of every gunshot wound in the throat, and in cases of doubt should try to meet it with renewed examination of the wound and operative tracing of the gunshot channel or at least with the most careful observation.

In spite of this restriction as to the value of the supposed direction of the gunshot for the diagnosis of injuries to the organs of the throat, the experience gained by observation of material, comprising approximately 100 cases, taught us that in most cases fundamental conclusions may be drawn from the external picture of the injury not only with regard to injuries to the organ, but also as regards the kind of injuries to the larynx. This recognition is more the important, as the decisive first clinical diagnosis usually has to be made by a non-specialist. I therefore based on it the following classification of gunshot injuries to the larynx. Numerous classifications of this kind have been made in part more from a pathologico-anatomical point of view, in part more from a therapeutic point of view. They all have their justification, their advantages and disadvantages. The best-known scheme is the one drawn up by KILLIAN, which is based on the respective level of the injured part of the larynx, with the characteristic associated symptoms. In practice, however, it became evident that in case of fresh and even in case of older injuries to the throat or larynx such a distinction could not always be made either with outside observation or with the aid of laryngoscopic and X-ray examination. Shell particles and other rough missiles among which deformed infantry missiles also are to be reckoned, often cause damage which affects several areas of KILLIAN's classification. In accordance with the objection of v. MEURER, KILLIAN extended his original scheme in this consideration. In figures,



however, this latter type of cases is at present even more frequent than during World War I, so that the value of this classification based on the level of the injury is impaired. Moreover, injuries perforating the larynx in a diagonal direction downward or vice versa, as well as the lengthwise ones cannot be placed in the classification of KILLIAN. Without doubt KILLIAN has the merit of having made, for the first time, a laryngologically founded classification of gunshot injuries to the larynx, considering the peculiarities of the larynx which is also the basis for my own classification in its essential points.

A classification of gunshots in the larynx made by HAERTEL, besides making a detailed division of the various gunshots, considers especially the perforating and non-perforating or destructive character of the gunshot.

The following classification of gunshot injuries to the larynx and the trachea is proposed: 1. Paralaryngeal shots. 2. Injuries at the entrance to the larynx. 3. Direct frontal shots. 4. Direct posterior shots. 5. Sagittal shots. 6. Longitudinal shots. 7. Destructive shots. 8. Tracheal shots. 9. Shots with the missile lodging in the larynx.

For specialist purposes we usually complete this short diagnosis in telegram style, taking into consideration as far as it is known and ascertainable, the accurate direction of the gunshot, the kind of missile, the special characteristics of the laryngeal area concerned, a gunshot with the missile lodging in the larynx, and possible complications. To justify this subdivision a short list is to be made of the peculiarities of the origin, the external picture of the symptoms, the other injuries of each individual group, the anatomical and functional consequences of the injury as well as the possible complications.

1. Paralaryngeal gunshots. Gunshots in closest neighborhood to the larynx may lead one to suppose a direct injury to the larynx in case of a certain position of the spot where the bullet entered or left the larynx. In this the result of the mirror examination is, besides exact location of the course of the shot channel of decisive importance. If no signs of a direct injury are to be found though an indirect affection of the inner larynx in the various forms: hemorrhage, edema, paralysis of the vocal cords, under certain circumstances also tears in the mucous membrane. In case of gunshots passing through, as well as of shots with the missile lodged in the larynx, the larynx may be affected in this form. Gunshots in the throat which show a strong effect of contusion may lead to extensive bleeding of the skin and mucous membrane. Larger hematomas in the area frequently extend as far as the region of the piriform sinus. Even injuries by shots more distant from the larynx may cause symptoms of injuries to the larynx by an increasing spreading of submucous hemorrhages, by infection and by inflammatory swellings. As far as purely traumatic reactions of the mucous membrane are concerned, which are particularly active near the entrance



to the larynx, they usually decrease considerably after a few days. The voice is often affected; severe dyspnoea, making tracheotomy necessary, is, however, very rare. Naturally grazing gunshots and the rare contour gunshots have to be reckoned among this group of gunshot injuries. The transition to injuries of the larynx proper are the ricochet bullets which often leave the cartilage still uninjured on the other hand, while they cause extensive tearing of the mucous membrane inside the larynx.

2. Gunshots at the entrance to the larynx. Because of their peculiarities this group of gunshot injuries was already defined by earlier authors. In most cases gunshots passing right through in a transverse direction are concerned in which the hypopharynx is always injured as well. Accordingly the difficulty of swallowing is clinically predominant so that often the diagnosis implies an injury to the esophagus, especially if neither the voice nor breathing are affected. Injuries and defects of the epiglottis are frequent, fractures of the hyoid bone by gunshot are also not seldom. The strong disturbance of the swallowing mechanism resulting therefrom gives rise to the great danger of aspiration and aspiration pneumonia. However, after they are healed fractures of the hyoid bone and epiglottis defects leave behind surprisingly little difficulty in swallowing.

3. Direct frontal gunshots. Under this designation shall be included frontal tangential gunshots in the larynx connected with an injury to the cartilage and frontal gunshots passing through the mucous membrane as perforating injuries. Both kinds of injuries differ with regard to the danger of a perichondritis which is naturally greater in the case of gunshots passing on through. It seems to me that the important point is that no severe associated injuries are to be expected, considering the superficial direction of the gunshot channel, and this justifies including them in one group. The opened larynx lumen is often completely exposed on account of the thin soft parts covering it and this encourages the insertion of a cannula at the place of injury. A secondary injury of a shoulder is also frequently seen with frontal gunshot injuries of the throat. After healing, frontal gunshots leave a narrow scar formation which may lead to diaphragmatic adhesions of the labium vocale, especially at the level of the vocal cords.

4. Direct posterior gunshots. They are to be distinguished from group 3 because of the possibility of severe attendant injuries, especially to the throat vessels, the vagus and the plexus. The more to the rear they occur, the greater is the danger of injuring the esophagus too by which, occasionally, an esophago-laryngeal fistula may be formed. If the cricoid and arytenoid cartilages are affected too, great danger of perichondritis threatens by infection of the hypopharynx. For this reason KILLIAN distinguished a special group of posterior subglottic gunshot injuries. Not less than 50 per cent of his cases were complicated by perichondritis. Permanent complications are particularly serious; often median fixation of the vocal cords through ankylosis of the arytenoid joints with dyspnoea, while the voice is preserved.



Anatomically midway, so to speak, between groups 3 and 4 are frontal gunshots by smooth projectiles passing through the thyroid cartilage, characterized by holes of caliber size where the bullet entered and left on both sides of the neck. Such gunshots passing through not seldom progress almost without symptoms if it so happens that neither vocal cords nor false vocal cords are damaged.

5. Sagittal gunshots. Frequently in this case shots with the missile lodged in the larynx are concerned, which, after penetrating the larynx and the esophagus are stopped by the vertebral column. In a pure form, taking their course exactly on the sagittal plane they must be considered as rare, since in case of great dynamic force of the bullet they are usually fatal, probably owing to injuries to the spine. Shots with the missile lodged in the vertebrae and prevertebral shots with the missile lodged in the throat have usually entered in a diagonal direction and thereby frequently cause injuries to the hypopharynx-esophagus and frequently do not affect the larynx.

6. Longitudinal gunshots. Longitudinal gunshot injuries to the throat and larynx according to the reports during World War I appear as typical injuries to soldiers hit while in a firing position. We have not been able to observe such a cause of origin ourselves. On the other hand, however, longitudinal gunshots in the throat occurred by gun fire from an airplane. A number of observations was collected in the literature of the first World War in which the missile entered the head, penetrated the throat longitudinally and came to rest in the chest or abdominal cavity, thus penetrating a large area of the body in an axial direction. It was very often observed that the bullet had entered at the lower jaw and in the further course of the missile cause a fracture of the hyoid bone, injury to the front edge of the thyroid cartilage and tracheal injuries. By this the anterior mediastinum is more or less opened up. The possibility of intrathoracic or even abdominal gunshot wounds with the missile lodged in the body must be considered too. If the missile does not enter the thorax the prognosis of these injuries may be described as comparatively favorable, severe as they may appear at first sight, because they appear as longitudinal-tangential gunshots in the larynx without extensive destruction or defects of the cartilage frame and the dangers to be feared arise more from infection of the opened up mediastinum, than from the pure tracheal injuries. With regard to the larynx the prognosis is more serious in the case of longitudinal gunshots which take an oblique and deeper course, e.g. such as enter at the floor of the mouth.

7. Destructive gunshots. In this group we have destructive gunshots causing rough complicated fractures, as well as the shooting away of large parts of the laryngeal cartilage frame. Besides the seriousness of the injuries they are caused jointly by larger, particularly multiple rough missiles. Men injured by destructive gunshots show a high primary mortality by suffocation. In cases where large parts of the laryngeal cartilage has been



shot off, aspiration is particularly dreaded. As by the shooting off of parts of the larynx a wide opening up of the air passages takes place we find the cannula nearly always lodged in the wound.

8. Tracheal gunshots. They are found frequently as attendant injuries of longitudinal shots and destructive shots in the larynx. In cases of isolated tracheal injuries the appearance of extensive emphysema is almost the rule. It may, however, be caused by an injury to the pleura and the apex of the lung. The dangers of tracheal gunshots are due to the possibility of infection of the anterior mediastinum, which, however, do not seem to be so great as one should expect theoretically. Among 9 cases treated by ourselves we had to register a disastrous result only once. The insertion of the cannula into the gunshot wound is sometimes not to be avoided if the tracheal injury is located deeply. With every tracheal injury a close search is to be made for a gunshot in the thorax with the missile lodged in the body.

9. Gunshots with the missile lodged in the body. The intralaryngeal location of gunshots with the missile lodged in the body is often unrecognized. Among gunshots with the missile lodged in the body are those in which the missile is lodged in the wall where it was stopped by the cartilage frame and those in which the missile is found in the mucous membrane on the side where the bullet entered or on the opposite side. Thus in contrast to gunshots with the missile lodged in the mucous membrane, gunshots in the wall with the missile lodging in the body are non-perforating injuries. In the majority of gunshots with the missile lodged in the mucous membrane observed by us the missile was found in the false vocal cord or in the sinus piriformis. Sometimes they may project right into the larynx lumen and may even be observed laryngoscopically. In the category of gunshots with the missile lodging in the body belong also those gunshots penetrating to the inside of hollow organs or internal gunshot wounds passing through from which material may be aspirated, coughed up or swallowed. Among 12 observations of my own on intra-laryngeal gunshots with the missile lodged in the body tracheotomy was required only 4 times, surprisingly not even in the case of an infantry missile passing freely through the subglottic area which lodged there nearly without any symptoms for 16 days. In cases of gunshots with the missile lodging in an organ so sensitive against mechanical and infectious injuries as is the larynx, a wide indication for **removal** of the missile, possibly by endoscopy, seems advisable. The most important measure for a first treatment of men injured in the larynx is the relief of any dyspnoea by tracheotomy. Besides this it serves also for prevention of aspiration, especially in the case of internal hemorrhage, if a larynx tamponade can be made from the tracheotomy wound and a tamponade of the throat from the mouth if the source of bleeding should be located there. A tamponade through the gunshot channel should be attempted only in case of life endangering hemorrhage and a gaping wound.



With very rare exceptions the demand for broad diagnostic indications for prophylactic tracheotomy with gunshots in the throat or larynx, which proved successful during World War I, seems to have found general recognition at present. Thus among 95 men injured in the larynx and trachea there are 59 on whom a tracheotomy had been performed mostly of whom were sent to us with cannula inserted while the minority of them had to be tracheotomized sooner or later. This large number of tracheotomized patients as compared with the report of KILLIAN, who during World War I had only 31 tracheotomized men out of 87 injuries to the larynx, is to be accounted for easily by the fact that a large number of seriously injured, e.g. with wide exposure of the air passages and esophagus caused by bomb particles, came to us for treatment, thanks to modern treatment facilities. Already during World War I HAERTEL had pointed out that one must not draw the deceptive conclusion from KILLIAN's report that 65 per cent of larynx injuries take a good course. He is, however, of opinion based on his findings and estimations that at least 70 per cent, but probably an even larger percentage of injuries to the larynx must be tracheotomized at the front on account of dyspnoea.

Agreeing in principle with WIETING, GULEKE and others we always consider prophylactic tracheotomy under field conditions as indicated in the following cases:

1. In cases of beginning dyspnoea.
2. In cases of marked or continuous hemorrhage from the air passages or the pharyngeal area.
3. In case of increasing skin emphysema.
4. In cases of strong swelling in the neighborhood of the air passages resulting from hematoma or from wound infection.
5. In cases of intralaryngeal shots with the missile lodged in the larynx and larger shots of the same kind in the immediate neighborhood of the air passages in which the missile cannot be removed immediately.

That injuries of this nature may take a favorable course even without preventive tracheotomy cannot lessen the justification of the fundamental requirement. Especially in cases when the time for transport cannot be fixed definitely, and when adequate supervision is lacking it is advisable to tracheotomize too often rather than not often enough.

In no fewer than 12 cases of gunshots in the larynx-trachea the cannula had been inserted at the place of injury sometimes after extending the gunshot channel. The conditions of the wound with direct frontal gunshots and shots shooting away parts of the larynx, sometimes with longitudinal gunshots too, positively invite one to do so. A general warning against such a procedure is certainly justified, because it may cause obvious complications and may favor the development of stenosis. Even when the cannula remained for some time no disadvantageous results were noticed in our cases. As a method of emergency and for guaranteeing the transport to a place with suitable



possibilities for treatment we would not reject it on principle. MARSCHIK too approves of this procedure as a makeshift. In any case it is safer and more appropriate than to not insert a cannula at all, relying on it that breathing through the gunshot channel will be sufficient for the moment, which may, however, be obstructed **at any time by** blood and secreta. It is hardly necessary to emphasize the fact that in such cases a typical tracheotomy is to be made as soon as possible. This applies also to 2 cases of cricothyreotomy or intercricothyreotomy which were registered in the patients' records as tracheotomy.

In the text books of war surgery we find again and again the exhortation to remove the cannula as early as possible, which is supported, if at all, by pointing out the difficulty of decannulation later on. In cases of simultaneous injuries to the hypopharynx and the floor of the mouth such a generalization of early decannulation is especially warned against in view of the possibility of late hemorrhages. With perforating injuries to the larynx this danger of hemorrhages is not so serious a warning, however, it is still quite as justified, on account of the possibility of infection of the gunshot channel with a subsequent perichondritis, which always means a serious complication. Especially with injuries of the subglottic area in which, after decannulation, considerable increase of pressure occurs during coughing and speaking, one should wait for a firm healing of the wound in the mucous membrane. An accurate laryngoscopic examination should always precede the removal of the cannula. In some cases we were obliged to use tracheotomy on account of perichondritis which certainly was connected temporally and causally with premature decannulation. Contrary to general opinion the duration of time the cannula is in place plays only a minor part when a suitable cannula and good care are used. Even when the cannula remained for weeks and months I cannot remember having ever experienced any great difficulty of decannulation with adults. I am, however, frequently obliged to make corrections with injured men sent to me for treatment already tracheotomized: to widen the tracheotomy wound or to insert another cannula, especially to exchange unsuitable fenestrated cannulas. If possible a high tracheotomy reaching to the cricoid cartilage is replaced by a lower one.

Occasionally I heard of field surgeons who in deliberate opposition to the other rules of war surgery practise primary suture for injuries to the throat and larynx after excision of the wound in the soft parts, probably starting from the consideration that the trachea must be restored by air means. Without the possibility of a real air tight and secreta-tight closing up of the larynx-trachea wall, in other words, if only the wound in the soft parts of the trachea wall is covered up, this procedure must be considered as positively dangerous, no matter whether there is a tracheotomy or not. The formation of emphysema, spread into the mediastinum, infection of the cartilage wound of the mucous membrane (perichondritis) and its neighborhood (phlegmon and mediastinitis) may and must be the consequence.



In exceptional cases a primary suture of laryngo-tracheal injuries may be permitted an experienced physician, provided a long period of observation is exercised. The omission would probably cause great dangers, thus e.g. in the case of a complete or nearly complete severance of the trachea or in the case of extensive lacerations of the injured cartilaginous larynx frame. In case of an injury to the thyroid cartilage too, in the form of a laryngofissure, one might expect advantages by a primary wound treatment and suture. I see, however, no sufficient reason to perform this under certain conditions, as recommended by HAERTEL on smaller and more harmless injuries too. In theory one can agree with HAERTEL under certain conditions, but in practice the possibility of making a perfect suture of the mucous membrane within the larynx might prove impossible. In particular the possible gain of time in convalescence should hardly be a temptation, considering the conditions in the field and the risk of an infection of the perivisceral connective tissue.

Quite another thing, however, is the question of active surgical treatment of injuries by gunshot of the larynx, in order to avoid stenosis through the formation of scars and shifted cartilage fragments. If one considers how long and difficult the treatment of chronic laryngeal stenosis is by either conservative or surgical methods, one would be inclined to favor a primary laryngotomy with suture of the mucous membrane, repositioning of the fragments and subsequent dilation treatments in order to avoid the development of stenosis from the very beginning. In my opinion difficulties in decision are created by unfavorable wartime conditions rather than by fundamental differences of opinion. If a violent hemorrhage of the larynx sets in, or a bullet is lodged intra-laryngeally, one would not hesitate to perform an early operation which usually would mean a splitting of the larynx. On the other hand it might in many cases be very difficult under front line conditions and by the presence of a marked primary traumatic reaction of the mucous membrane, to get a clear picture of the kind and extent of the injury to the larynx. This is often only possible in the special wards of a reserve-hospital containing all the necessary paraphernalia, that is at a time when a formation of scars has already taken place so that one cannot replace the dislocated fragments. On the one hand, if on looking at unexpected serious scarlike changes associated with a late laryngeal fissure one thinks of how suitable and timely an early operation would have been, it is on the other hand necessary for surgeon and patient to have patience, if the early operation is no longer possible. I have seen again and again that not only edema but also swelling, which I first believed to be permanent changes, has improved considerably after weeks or months. Also with a seemingly rigidly fixed arytenoid joint, which even when touched with a probe impressed one as being ankylosed, later on gains a certain mobility so that a decannulation was still possible.



The decision, whether an early operation is advisable or not, depends to a large extent on the possibility of determining in time and with sufficient certainty the consequences of injuries to the mucous membrane and the larynx frame, which may result in a permanent and serious difficulty of breathing. We have the conviction, that the period of treatment of mucous membrane and cartilage-injuries can be shortened by an early operation, without reducing the certainty of success.

Traumatic suppurative perichondritis is always a very serious, regrettable and not too rare complication, endangering the healing process and the results of treatment of bullet injuries to the larynx. This complication may follow even small injuries to the cartilage, seemingly harmless in the beginning. This makes necessary a tracheotomy even with injuries in the later stages of treatment. We were not able to confirm either with regard to incidence or ratio of localization with our patients the statement of KILLIAN that perichondritis occurs especially in cases of injuries to the upper part of the larynx in about 28 per cent of the cases as against 9 per cent of injuries to the lower parts. It is noteworthy in clinical respects that even serious suppuration and purulent discharging forms of perichondritis frequently show only a slight increase in temperature and in spite of marked edematous swelling of the mucous membrane create only surprisingly slight difficulties in swallowing. The concept of the necessity of surgical treatment for suppurating perichondritis of the thyroid and annular cartilages and also the drainage of internal or external abscesses of perichondritic origin has been generally accepted. It is based on the research work and successes of HINDSBERG. Suppurating perichondritis without surgical treatment used to mean a complication endangering life, e.g. suffocation, aspiration-pneumonia, spread by gravity into the mediastinum, general sepsis. We have had, with timely intervention, no death among our patients. The disastrous significance of any perichondritis combined with bullet injuries of the larynx consists first of all in prolongation of the disease for weeks and months, in the formation of excess granulation tissue of perichondritic origin, causing stenosis, by the constriction of the subglottic cavity, especially with perichondritis of the annular cartilage and not least of all in a median fixation of the labium vocale by scars or ankylosis of the arytenoid joints. The seat of the perichondritis or of the abscess must always be opened, diseased cartilage, granulations and sequestra must be removed subperichondrally with the sharp curette, in which case frequently one or even both lamellae of the thyroid cartilage will be destroyed by this procedure. The annular cartilage **lamella must be** exposed widely by a median incision of the mucous membrane. In one case the operation of a subsiding perichondritis after laryngofissure disclosed a big sequestrum caused by the breaking through of a suppurating perichondritis of the annular cartilage in both directions. Even though a supporting frame of bone may develop from the remaining perichondrium, one may often see in X-ray pictures extensive calcifications almost regularly which develop into permanent stenosis following serious cases of perichondritis. Cases



of slow healing perichondritis, not suppurating, usually confined to circumscribed thyroid-cartilage areas, have sometimes been observed as late complications. They all underwent involution by conservative treatment and usually resulted only in slight hardening of the cartilage (plastic perichondritis). In one case of a loss of the epiglottis caused by a gunshot wound a perichondritis of the stump appeared several weeks after decannulation which necessitated a secondary tracheotomy.

In establishing the indications for removing bullets lodged inside the larynx or in the throat we usually go far beyond the general surgical principles. We were brought to that decision by the following experiences and considerations: the danger of infection with lodged missiles, which have passed through the trachea or esophagus, is a particularly great one. Moreover it is impossible to keep the surrounding tissues in a fixed position, so that a reactivation and extension of an otherwise mild infection results more frequently than in any other part of the body. Lastly, the already healed injuries of the mucous membrane may produce a new infection of the track of the missile even after a long lapse of time, an event which an angina or a catarrh of the upper respiratory passages seems occasionally to favor. Missiles lodged either in the throat or larynx have proved to be especially in danger of infections during the winter months of the war by carrying along with them particles of cloth from collars of uniforms, overcoats, headprotectors, a circumstance which has to be taken into account if an operation for a lodged missile is indicated. Lastly when a missile is lodged in the mucous membrane of the larynx, one has also to consider the possibility of a spontaneous ejection into the lumen with its aspiration.

An absolute location of the lodged missile is possible in every case with the help of all means for diagnosis, particularly by direct examination of the larynx and by X-ray methods. X-ray pictures in two planes are often not sufficient to give even approximately as good an idea of the location of the splinter, as does a skillful fluoroscopic examination. It also makes it easier to decide the best way of getting at the missile, to locate the area of the skin nearest to it, and to ascertain its movement by feeling and moving the soft parts during the act of swallowing. X-ray pictures taken one above the other and A-PX pictures of the larynx after insertion of the film into the hypopharynx are usually just as useless for the location of missiles lodged in the larynx, as the high frequency metal searcher, which was often considered necessary for the operation for their removal. One should never operate relying merely on X-ray pictures which may have been taken some time before, because a shifting of the bullet may have occurred in the meantime, or it may have been spit out or swallowed or aspirated. To avoid such mistakes, a fluoroscopic examination must be made immediately before the operation, which should never be omitted. Among 12 bullets lodged intralaryngeally there were 2 cases which had been operated on externally in vain several times (opening up of the oesophagus and laryngofissure) though the splinters were



so situated that after an exact location their removal was quite easy and could be performed in a very short time. In 2 cases bullets lodged in a suitable position were removed successfully by fenestration of the thyroid cartilage, in one case by a subhyoid pharyngotomy. We have so far managed to avoid laryngofissure which represents the typical access-operation and which also makes it possible to survey in detail the extent of the injuries and their consequences, including the treatment of hemorrhage by following the track of the missile. The indication for removal of bullets by endoscope has to be limited to the visible, or at least clearly detected, bullets lodged immediately underneath the mucous membrane of the pharynx, the larynx and the trachea, provided that there is no danger of violent hemorrhage and that the foreign body can be grasped with the right instruments without danger of aspiration.

When missiles lodged in the sinus piriformis, after having pierced the lumen of the trachea or oesophagus and which are thus situated on the opposite side of the spot from where the bullet entered, are exposed from the outside, they easily slide back into the lumen through the short canal of the missile in the mucous membrane which has usually been enlarged by infection. Aspiration must be avoided by careful creation of a wide access, suitable posture (elevated pelvis, FREUDENBERG's position) circumstances permitting, also through preventive tracheotomy and tamponade. If there are limited space conditions, the employment of nose-speculae instead of blunt hooks is imperative in order to keep apart the edges of the wounds. Blunt hooks have proved to be superior to all ingeniously constructed grasping forceps for the removal of foreign matter such as in case of dislocating splinters from their beds.

The treatment of remaining permanent effects on the larynx and trachea after injuries to them, e.g. stenoses and impediments in speech, requires a very experienced physician, and physician and patient alike have to show much patience. The aim is very simple to describe: restoration of a sufficiently wide air passage and a normal voice. Owing to the rarity of injuries to the larynx in peace time, only a few specialists possess enough experience with the numerous and various conservative and surgical methods to be able to estimate their advantages and drawbacks or their applicability in each single case immediately. The adaption of the method of treatment to the individual case, when there is no other injury, is as important as with stenoses of the larynx and has to be based upon an exact knowledge of the consequences of the injuries in anatomical and functional respects. It is, under these circumstances, a logical demand, that the injured man must remain under the care of one physician during the entire period of treatment. The best possible treatment results will be obtained, if all these cases are sent to a special hospital, a procedure which already has proved its value in the first World War under KILLIAN.



Each stenosis of the larynx due to an injury by gunshot which may have taken place weeks or even months before, requires first the determination of whether the required state of quiescence has set in, and if the process of healing makes good progress. There are no objections to beginning treatment by either surgical or conservative method if no inflammatory reactions of the mucous membrane, swellings or edema are recognized. The choice of treatment depends entirely upon the type, character and extent of the stenosis. By functional investigation it must be ascertained if the air can pass freely during temporary closing of the tracheotomy wound and thus one gets a good idea of the actual degree of the narrowing. Edges and folds of scars which protrude now on one side and then on the other side like wings on a stage, sometimes have the appearance of severe stenosis, because they prevent an unobstructed view into the trachea. To ascertain whether the air can pass tolerably is important since one is inclined from the beginning to create an additional widening of the trachea by conservative methods, even though stenoses of slight to medium degree do permit unhampered breathing. But in cases of actual severe stenosis the surgical method will frequently be the only appropriate procedure. In only a comparatively few cases will it be possible to decide immediately on the best method of treatment after an examination by the laryngeal mirror. Usually all the diagnostic means will be needed to form a clear idea of the character of the stenosis. The direct methods of examination, including those directed backwards from the tracheotomy opening, thorough X-ray examination including fluoroscopy and lateral views at various levels and also a presentation in relief of the mucous membrane by means of contrast must be employed for this purpose. The most frequently encountered traumatic stenoses appearing singly or combined are:

1. Circumscribed fold-cord- or diaphragm-like scars of the mucous membrane,
2. Coalescence of the vocal- or the false cords at the anterior commissure,
3. Extensive changes of the wall due to callous padding of the scars, healed but deformed fractures and perichondritic growth of cartilage,
4. Median fixation of the vocal cords by ankylosis of the arytenoid cartilage, usually due to annular cartilage perichondritis or to contraction of the scars on the posterior wall.

If one considers in addition, that frequently flat scars instead of cartilaginous defects such as at the margin of the thyroid cartilage lead not infrequently to a flattening out of the entire lumen, one gets an idea of the variety of types of stenoses.



In contrast to the older reactionless stenoses is the group of fresh constrictions which are much more difficult to evaluate and along with which one can recognize extensive laryngeal edema and swelling of the mucous membrane. Here it is important to decide if these findings are the results of long lasting perichondritis or simply the effects of disturbances of circulation due to scar formation whether an active treatment can be undertaken, or whether it is better to wait for some time. The most propitious time for the use of conservative dilating procedures is when the inflammation has disappeared entirely, while the formation of scars has not yet reached its final stage. In these cases we usually try to ascertain first whether the local findings undergo a change through active hyperemia, light therapy and injections of calcium. If involution takes place or conditions remain entirely unchanged, one may start slowly with gentle dilating measures of short duration. Any reaction of temperature, as well as local or general reactions, requires a temporary interruption of the treatment, and in cases of a strong reactivation of inflammatory processes, when circumstances permit a change of treatment.

If one cannot ascertain the nature of the stenosis, or if swellings or scars obstruct the view into the deeper recesses, an exploratory opening of the larynx is to be taken into consideration. Thus, many strange laryngoscopic findings, difficult to explain otherwise, are explained in a surprising manner by locating a center of granulations, a sequestrum, or mucous polyps, or a fistula unnoticed before. For the treatment of stenoses of a permanent nature, due to an injury to the larynx by a missile, we have at our disposal the bloodless treatment by dilatation and the surgical procedure, both of which aim at restoring a sufficient width of the trachea. For treatment with bougie, first of all, the milder cases of the pure scar stenosis are to be considered. Space-creating plastic operations rarely have the desired effect. One has rather to endeavour to preserve the width of the trachea and to prevent a renewed contraction of scars and to avoid a new formation of stenoses. This dilatation-procedure following operative intervention is therefore above all a purely passive measure. It is important to differentiate between this method and the proper dilatation procedure, the real stretching of stenoses, in order to avoid misunderstandings. The employment of the same instrumentarium for both purposes gives support to such a linguistic and inherent inaccuracy. The purposes aimed at both procedures are as different as, to use a comparison, the reduction of a fracture from the fixation of a fracture by plaster cast. How much the borderline between proper dilatation treatment and operative procedure is confused can best be explained by assertions from BRUEGGEMANN, that excision of scar stenosis is frequently necessary before an insertion of sounds and that before insertions of sounds the stenosis should be widened by using a dilator.



The great number of instruments and methods for dilatation procedures, as also for surgical procedures, will not and cannot be described here in all details. For treatment of the above mentioned types of traumatic stenosis, the following procedure is chosen quite frequently:

The circumscribed scar formations under 1. (above) are well suited for proper dilatation treatment, which according to location, may be undertaken either through the mouth or with sounds retrogressively from the tracheotomy-opening. Among the various forms of sounds BRUEGGEMANN's cannula sound is probably the one most useful and most frequently used. Endolaryngeal intervention, incisions and excisions of the scars in addition to the dilatation treatment may be necessary or might at least be useful for shortening the period of treatment. The scar deformities of the vocal cords of group 2 due to injuries by frontal shots are frequently accompanied by serious impediment of the voice. Their firm condition requires, as a rule, a division or excision by surgery with the use of the endoscope or from the outside. Owing to the well-known inclination to renewed formation of scars and to prevent renewed coalescence, a preservation of the width gained by preventive dilatation by insertion of discs is required. Caustic or cold caustic severing subject and observation of cases which were treated unsuccessfully in this manner in some other hospital.

Changes of the walls of lesser degree, as described in group 3 may be subjected to dilatation treatment with promise of success. On extensive severe scar-stenosis, especially if a cartilaginous growth of perichondritic nature develops, such as is frequently observed after serious injury by gunshot, we have immediately undertaken the submucous excision of the tissue from which a stenosis is developing with the formation of a laryngostomy, which we carefully covered with hairless skin from the supraclavicular pits as advised by KILLIAN. The lobes, which are based at the lower borders of the laryngostomy on both sides, are raised and carefully united to the mucous membrane of the larynx. Defects of the mucous membrane may be replaced during this process by pulling the lobes more or less strongly into the lumen of the larynx. The mucous membrane, lining the formerly narrow lumen, is usually not large enough to cover the widened trachea. The incised portion of the thyroid cartilage will also be covered by this procedure so that necroses at the edge of the cartilage can be avoided. The skin of the throat which is easy to move at the place from which the flaps were taken can almost always be united successfully by primary suture. Particular care has to be taken in sewing the edge of the skin at the upper borders of the laryngostomy as otherwise both sides might grow together by the presence of granulations and thus cause a gradual narrowing down of the laryngostomy which will obstruct a free view towards the entrance of the larynx and increase the difficulties for preserving the width obtained for the lumen of the larynx. In the majority of cases we have used rubber tubes for preventive dilatation, as recommended by KNICK, which proved very serviceable if employed in surgery on laryngeal stenoses in pre-war times. We have never observed irritations of such



serious nature that we had to interrupt the treatment, even if it lasted for months. Tamponades, following plastic operations, have always proven excellent, if hard cylindrical tampons were covered with Epithen ointment. I consider this method the most gentle one for after-treatment, but unfortunately the most troublesome one, as the tampons have to be changed daily or at least every other day and must be observed continually for the proper position. If the use of a rigid bougie was required, for instance for the purpose of spreading the thyroid cartilage-lamellae, it was always chosen according to the actual condition of the wound. VOGEL has lately used individually formed bougie made of STENT's mass, to which he ascribes certain advantages if compared with BRUEGGEMANN's sound. I already pointed out in the final words of my lecture in Breslau, that I do not consider STENT's mass the ideal material for sounds, because it easily disintegrates, possesses a certain roughness of surface which leads to irritation of the mucous membrane and may break comparatively easily. Dentists have made sounds of rubber for us which satisfy all requirements for comfort and do not break easily. Occasionally casts of dental material (BAYER) were made of the lumen of the larynx, which permitted free breathing through the upper passages.

If the lumen of the larynx should prove to be of sufficient width after a lengthy, preventive dilatation treatment, the laryngostomy is closed by plastic operation and the cannula is removed later on. In cases of median fixation of the vocal cords through ankylosis of the arytenoid joints, frequently mistaken as double paresis posticus, the decannulation in general results in a weakening of the voice. The most varied kinds of excisions of the vocal cords (KILLIAN), shifting of the vocal cords (VOGEL), ~~with more or less extensive sacrifice~~ of the arytenoid cartilage, even a "submucous exenteration of the larynx" (SERCER), have been recommended and executed with variable success. In these cases also there is the necessity for an after-treatment with tampons or dilatating instruments. The success of all these complicated treatments which require much time often depend less on the employment of certain methods and rather on mastering and executing them carefully. When I reported in 1936 on laryngeal and tracheal stenoses which are encountered very rarely and also mentioned their surgical treatments, I pointed out, that not every time does one achieve success with just one special procedure, frequently praised as the most simple one, but that during the treatment of a particular case various changes of the plan of treatment are often required. On account of the long duration of the treatment, a critical comparison of the diverse methods used with our patients cannot be undertaken as yet.

The necessity and the success of voice-treatment by physicians after injuries to the larynx and after-treatment of stenoses must be pointed out explicitly.



If an injured person has to wear a cannula permanently after injury to the larynx by a missile, even though the voice is normal, I consider the conditions justifying an award of the Silver medal have been fulfilled. The same proposal is made for injured persons whose breathing is hampered by stenoses and whose speech is impeded in a manner which will not allow them to take a job which requires fairly heavy work or a profession in which they have to use their voice. The above named injuries seem to me at least as grave as the loss or the permanent uselessness of a hand, a foot or an eye.

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#### Discussion:

VOGEL: The employment of sounds made of protective materials is reported as a substitute for BRUEGGEMANN's cannulas, which are difficult to obtain in wartime, for the after-treatment of surgically treated scarred stenoses of the larynx. As an advantage, the possibility to give the sound any size or form, to control the area of the larynx during the after-treatment constantly and to combine this sound with any cannula of normal width, is emphasized. After the complete healing over of the inside of the larynx, a plastic closure of the laryngostomy should be undertaken, which has been kept open up to that time. In cases of contraction of the vocal cords in a median position by a scar in the posterior wall, shifting of the vocal cords is advised: laryngofissure, severance of the vocal cords and the laryngeal pouch cords (false vocal cords) from the insertion at the arytenoid cartilage, excision of scars, covering by a THIERSCH graft, fixation of the graft and vocal cords by insertion of a STENT's sound in such a position that it will secure sufficient width of the glottis. After the healing over of the wound at the rear wall, closure of the laryngofissure should take place spontaneously. STENT's mass must be softened and moulded over the spirit flame when in a dry condition, not in hot water, otherwise it will get brittle.

SEIFERTH: Missiles lodged in the wall of the larynx can be removed as a rule by fenestration. Once only I was obliged to perform a laryngofissure. - Retained smooth missiles in the walls of the larynx and the trachea may slip down during an operation from the outside just as easily as during a removal by endoscopy. The choice of the method to be employed depends entirely on the position of the projectile and the possibility of locating it. As a sure indication for performing a tracheotomy I especially mention the developing of threatening development of emphysema.



BRUEGGEMANN: We see again and again that even extensive injuries to the larynx do heal up finally with remarkably good function. Therefore I object to deforming operations on fresh injuries of the larynx. One should not remove particles of cartilage that are needed later on. For the preservation of cartilage the cannula sound should be used more frequently in severe injuries to the larynx accompanied by destruction of cartilage. I have already used this method successfully in the first World War. Unfortunately, the cannula sound is not to be obtained any more. I am often asked for it but cannot spare one. Perhaps some official action can recommend the production of cannula sounds.

HUENERMANN: Experiences of GREIFENSTEIN with his own patients and his report on those cases prove, that the treatment of injuries to the larynx by bullets requires certain qualifications which only physicians with special clinical experiences in rhinolaryngology can possibly possess. There is always a certain risk in cases of injuries of the larynx that patients who are not sent to a specialist will not be appropriately treated. In one case of nasopharyngeal fibroma, who had been in a large ward for patients with diseases of the ear, without specialist treatment for 442 days, proves that the establishment of wards for men with serious laryngeal injuries is necessary.

BARTH: In cases having indications for a tracheotomy an early transfer and good transportation must also be kept under consideration. The decannulation should not be undertaken at all by the medical establishment at the front and should take place only when the injured person can remain under appropriate long lasting observation by specialists. It is wrong, when the tracheotomy is performed at the main dressing station, the cannula removed 2 days later and then the injured man is taken to a field hospital, as I have observed once. In an emergency one may insert a cannula into the track of the missile itself, but this should not be the rule. One has to be warned against undertaking excisions of wounds, removal of broken off parts of the cartilage and more or less extensive sutures at the most advanced medical establishments. As a rule, one has to consider the possible sudden removal of the wounded and one never knows how soon they will again be under the care of specialists. Besides there is the possibility of removing, without need, precious material, necessary for later plastic operations.

PERWITZSCHKY: It is sometimes surprising how well, even in functional respects, laryngeal wounds heal underneath suitable dressings. For that reason one has to warn against too active intervention.

ZANGE: With gunshot injuries of the pharynx and the esophagus in the neck, combined with serious difficulties in the swallowing process, neither the tracheotomy nor the closing off of the larynx from the tracheotomy gives sufficient protection against aspiration pneumonia. In these cases, SOEREN's laryngeal drainage is the most certain prophylactic measure.



MUENDNICH: The enthusiasm of surgeons at the medical establishments at the front for performing tracheotomies is very great. With paralaryngeal and paratracheal gunshot wounds a tracheotomy is frequently made without an obvious reason. Usually there is a sufficiently long waiting period at hand so that there is no need for immediate intervention. The danger of a tracheotomy placed too high with an injury to the annular cartilage is not well enough known among the surgeons. It should be especially pointed out in the directives.

GREIFENSTEIN: Emphysema has of course been considered as an indication for a prophylactic tracheotomy in the directives. STENT's mass is a very poorly suited material for the production of individually formed sounds, whereas synthetic rubber on the other hand has given proof of its suitability already in the manufacture of dental prostheses. The seat of perichondritic fistulas or abscesses in the cartilage must always be exposed widely and be cleaned out radically. A careful long lasting drainage has to follow in order to prevent a new inflammation.

### 3. Surgery of grazing wounds of the ear and forehead.

Oberfeldarzt (Lt. Col., MC.) Prof. Dr. HUENERMANN

Through well chosen examples the necessity of consideration by the ear, nose and throat specialists of all gunshot injuries which involve the ear and adjacent cavities is pointed out. In addition the necessity for an examination by an ear specialist of all gunshot wounds of the head, as well as injuries caused by blunt objects, is noted. The reason for the consultation with ear, nose and throat specialist is that only he is in a position to recognize possible injuries to the ear and adjacent cavities of the nose with his special examination methods. Careful X-ray examinations of the skull and special X-ray pictures are necessary too. These are very difficult to get, because the technique of it is not yet well mastered. Doubtless one should strive for improvement; conditions will improve somewhat by introduction of the helpful implement mentioned by BERGERHOFF, which will constitute a valuable addition to the field X-ray outfit. The smallest costs of these implements will be paid for in a short time through the saving of films.

With gunshot wounds of the ear and accessory sinuses there always exists the danger of simultaneous brain dura injury and therefore the danger of meningitis. In all these cases one is not concerned alone with the care of the brain injury, but in addition the mastoid cells and the accessory sinuses, which have been opened up by the shot, have to be cleaned out. Especially good care has to be taken to obtain the best possible drainage. Another great danger exists with these wounds through the fact that they tend to deceptive healing and under the tissue scar remaining bone-fragments and parts of injured mucous membrane frequently continue in a latent inflamed condition, which can lead through an incidental catarrhal infection of the nose suddenly to the worst complications.



In a similar way one must point out the necessity of being alert for dammed up infection in the mastoid cells and the frontal sinus, especially when they are closed by damaged bones. The X-ray picture gives information about this condition, because a cloudiness can be recognized within the limits of the plugged sinuses. Even many months after such an injury a latent inflammation might develop, as happened in one case, where subsequently brain abscesses and suppuration of the cerebral dura occurred. In order to avoid these late complications a cleaning out of the closed-up sinuses is necessary. The best and most certain ventilation of the frontal sinus is possible through insertion of a little rubber cap, which has to stay there for 6 weeks, according to the method of SEIFFERT.

The earlier gunshot injuries of the ear and accessory sinuses are presented to the specialist, and the earlier they are treated by him, the better will the danger of fatal late complications be avoided.

The special field of surgery of the ear and accessory sinuses has to make use of the experience in war surgery and has to adopt the elementary principles of general surgery and to enlarge the experience upon them. Much clinical experience is necessary in order to master the very difficult problems presented by injuries of this kind. For that reason it is recommended, that in addition to establishing a large number of ordinary special wards, that in larger sections an extra division should be fitted out for the seriously wounded and to assign to it the most complicated cases.

#### Discussion:

PERWITZSCHKY: A similar instrument for arrangement of positions suitable for the taking of X-ray pictures of the skull has been mentioned already by BRUENING and has proved to its usefulness. During late operations for the purpose of closing up a persistent fistula in the frontal sinus, special precaution must be observed as scars which have closed bone gaps might be torn out quite easily, and in this way meningitis might be more possible.

GREIFENSTEIN: A negative X-ray picture does not exclude the presence of extensive depression-fractures when there are grazing and tangential gunshot injuries of the mastoid. On the other hand a haziness of the cell-system in newer injuries may be occasioned only by traumatic edema of the mucous membrane and by hemorrhage in the cells. The clinical findings are the deciding factors for the necessity of operation.

SEIFERTH: The prospects of successful treatment of frontal basal brain injuries are good, when adjacent sinuses are cleaned out thoroughly. Meningitic processes, which have been fed by the adjacent sinuses, healed up in a short time when remnants of the sinus were cleaned out during a later operation. A mastoidectomy must be performed in all cases when injuries of the mastoid occur. If the antrum (mastoid) is not opened up an otitis will develop and a later operation will always be necessary in this case.



Directions from Consultants' Committee on ear, nose and throat.

The group of specialists on ear, nose and throat has been admitted for the first time to the meetings of the consultant physicians. According to peacetime experiences diseases of the ear, nose and throat comprise about 30 per cent of all the cases of illness. In the statistical sick reports of the Army this percentage is not reached, because many cases in our field disappear into other columns.

A great part of the injuries in our speciality are life endangering but may be overlooked easily because of the small external wounds.

It is not possible for our special group to formulate directives on all pressing questions in our entire branch during the first participation at the conference. We therefore had to limit ourselves to a few important themes.

I. Gunshot injuries of the larynx, laryngeal stenosis and their treatment.

Every injury of the larynx and/of the trachea must be considered a potentially serious throat injury. The first consideration has to be the evaluation of all accompanying injuries of vessels and esophagus which might have to take precedence in the treatment.

The recognition of a laryngeal injury is simple if injured cartilage structure or the exposed lumen can be observed in the wound. All other symptoms such as difficult breathing, voice impediment, difficulty in swallowing, coughing out of light red blood and emphysemas are ambiguous and do not prove anything with certainty. All these symptoms appear likewise in injuries of the food passages with indirect participation of the larynx through haematoma, edema, paralysis of the recurrent nerve or with injuries to the pleura apex and peak of the lungs.

The following classification of important, reliable clues gives guidance to the non-specialist, especially about first evaluation and the urgency of a speedy transfer:

1. Paralaryngeal shots,

With the involvement of the inner larynx through hemorrhage, edema, tearing of the mucous membrane and recurrent nerve paralysis. Frequently voice impediments. Occasionally dyspnoea. Laryngeal mirror examination is important. Usually prompt improvement of symptoms.

2. Injuries of the entrance of the larynx.

Usually from frontal shots. Hypopharynx always injured too, therefore is frequently diagnosed as an injury of the esophagus.



3. Anterior frontal shots (midline).

(Tangential and perforating shots).

General: Absence of serious injuries to the surroundings. Insertion of cannula frequently possible in wound itself.

4. Posterior frontal shots (lateral to the midline)

Accompanied by injuries of vessels of the throat, and the nerves of the vagus-plexus. The more dangerous the farther back (esophagus) and the higher up the track of the missile runs (injuries of annular and arytenoid cartilage with infections from hypopharynx and danger of perichondritis).

5. Sagittal shots.

Appears rarely in pure form. Usually missiles are stopped by vertebral column after passing through the larynx and esophagus. In every case of a missile lodged in the throat para-vertebrally and in the vertebra (mostly diagonal shots) one also has to watch out for injuries to the esophagus and the larynx.

6. Longitudinal shots.

Entrance of missile frequently at lower jaw, in face, sometimes in the cavity of the mouth. Injury of hyoid bone, larynx structure, possibly involvement of trachea, opening up of the anterior mediastinum, missile lodged in the thorax. In regard to the larynx the prognosis is more serious with slanting and deep penetrating longitudinal shots.

7. Destructive shots.

Mostly through large and multiple missiles, which cause large, complicated fractures (high primary mortality) with wide opening of the respiratory passages. In this case a cannula usually may be placed in the wide open larynx.

8. Trachea shots.

E.g. also as attendant injury of longitudinal and destructive shots of the larynx. In isolated cases of tracheal injuries emphysema frequently occurs. One should watch out for injuries of the pleura and esophagus. Danger of anterior mediastinitis in every injury to the trachea. Insertion of cannula in wound, sometimes located very low. Search for lodged missile (in thorax).

9. Penetrating shots (lodged missiles).

Missiles lodged in walls stopped by cartilage and lodged missiles in mucous membrane at the entrance or on the opposite side. In addition shots which penetrated to the inside which might be aspirated, coughed out or be swallowed. The intra-laryngeal location of a penetrating missile will often not be recognized. Generally, eventual removal by endoscope is the correct indication.



The treatment of injuries of throat and larynx must and should be only preventive and symptomatic in medical units at the front sufficient to alleviate difficult breathing and hemorrhage. Even if there exists only questionable injury to the food passages (trouble in swallowing, emphysema, salivation), on account of the danger of phlegmon of the throat and mediastinitis an attempt to clean up the situation by revision of the wound and a following up of the shot canal should be made. A speedy transfer to a special ward is unquestionably desirable.

The request for specific indications concerning prophylactic tracheotomy, a procedure which has proved its value already in World War I, has been emphasized unconditionally by experience in the present war. Under field conditions the indication for preventive tracheotomy is given by: 1. onset of dyspnoea, 2. profuse or persistent hemorrhage from the air passage or the larynx pharynx, 3. increased emphysema under the skin, 4. large swelling of the tissue surrounding the airways due to hematomas or wound infection, 5. intralaryngeally lodged missiles and larger missiles lodged in the immediate neighborhood of the air passages which cannot be removed immediately.

Especially, if the time of transfer is uncertain and transportation is without sufficient supervision then one may perform a tracheotomy rather once too often than once too seldom.

A tracheotomy should be located below the wound, if possible outside of injured soft parts. Insert the cannula in the entrance or exit wound only as an emergency solution, although it cannot be avoided in some cases of tracheal injuries. The tracheotomy should be performed in the correct manner as soon as possible.

Besides creating a certain passage for breathing a tracheotomy serves also for the prevention of aspiration, especially in cases of hemorrhage in so far as a laryngeal tamponade may be made from the tracheotomy wound outward and a tamponade of the esophagus can be undertaken from the mouth outward and the source of bleeding then located. A tamponade through the shot-canal should be undertaken only in cases of serious hemorrhage and a wide open wound. A drainage of the larynx is necessary with longer lasting impediments of swallowing and should be performed according to SOERENSEN.

Decannulation may be undertaken only when firm healing of the wound of the mucous membrane and cartilage can be depended on (otherwise there is danger of perichondritis) and when the laryngoscopic examination has demonstrated a free lumen of the larynx and (especially with injuries of the hypopharynx) the danger of bleeding, including late bleeding by erosion, have been eliminated. If a tracheotomy has been performed correctly and faultlessly then the length of time the cannula has been in the wound plays an unimportant role as a cause of a difficult decannulation. A cannula should not be removed by field medical units a short time before transfer.



A primary suture of laryngeal and tracheal gunshot wounds is taken into consideration by the expert only when omission of it would result in greater danger and more serious consequences (e.g. with extensive tearing of the trachea or much exposure of injured cartilage structure). The otherwise very frequently useful and advantageous early operation, laryngotomy with the care of the mucous membrane, cartilage and dilatation treatments, will remain the exception under field conditions, because it cannot safely be decided whether the consequences of the injuries will lead to a permanent serious stenosis. Serious injuries to cartilage with profuse hemorrhage or larger missiles lodged intra-laryngeally would be the most frequent indication for an early operation.

The residual permanent damage following laryngo-tracheal injuries such as stenosis, voice impediments, requires the planning of a highly individualized treatment which must be followed faithfully and which should take place always in the same ward, if possible in special wards. Emphatic attention must be directed toward the necessity and the success of the treatment of the voice, after many injuries of the larynx and following treatment of stenosis.

## II. The care of injuries to ear, nose and associated injuries.

1. According to our experience most of the cases of meningitis following gunshot injuries of the head arise in the ear and nasal accessory sinuses.

2. The results of treatment of head injuries can be improved on considerably if during the primary care not only the brain dura wound is attended to, but also that the adjacent accessory nasal sinuses and the air cells of the ear are carefully cleaned up.

3. Consultation by surgically trained ear, nose and throat specialists for the diagnosis and treatment of these wounds is necessary, as well as concerning all injuries to the upper jaw and face and admission of such wounded to the ear, nose and throat wards in medical establishments farther back to the rear should be used.

4. Judgement of injuries to the ear and accessory nasal sinuses depends to a large degree upon faultless X-ray views of the skull, if possible stereo-pictures. The average technique in the field of roentgenography leaves much to be desired. It must be improved upon. The adjustable apparatus mentioned by BERGERHOFF (Deutscher Militaerarzt, 1942, Heft 4) gives considerable help in the focusing process. Its rapid introduction, which is already planned, should be made possible. Besides this, the technical assistants have to be instructed about correct focusing etc.

5. The condition of the eardrum and ear canal or the ability to hear of itself does not justify a deduction concerning the involvement of the ear but rather the X-ray findings and the clinical symptoms convince the otologist about the kind of the injury.

6. In most cases operative treatment is necessary as soon as the mastoid cells and the middle ear have been opened up. Ear injuries incline to deceptive healings, in which the wounds of soft parts grow scars, while the bone wound continues in a latent inflamed condition out of which it easily develops into a late meningitis, if the site of injury is not cleaned out.

Also with frontal sinuses and ethmoid bone injuries a cleaning out of the diseased bone and mucous membrane parts and the creation of good drainage is necessary.

7. In order to facilitate the execution of the many difficult tasks, produced by this kind of complicated injuries, the establishment of special wards for the seriously injured (with each Army, Medical Department or Army District) will be recommended, which will have to be fitted out exceptionally well with good instruments and able personnel. All complicated or doubtful cases are to be transferred to them. The smaller wards (with peacetime sicknesses) and the dispensaries should be left in the care of those physicians who do not practise surgery in peacetime.



VI.

PROCEEDINGS OF THE CONSULTANTS'  
COMMITTEE ON HYGIENE  
AND TROPICAL HYGIENE

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Translation prepared by:  
Office of Military Government for Germany (U. S. )  
Office of Naval Advisor  
Medical Section

Typhoid and paratyphoid experiences.  
(See Section VII, Article 7)

Problems of encephalitis, etc.  
(See Section XI, Article 4)

A. Combined and adsorbate-immunization serums.

1. Tolerance to a new combined vaccine against typhoid, paratyphoid and cholera.

SS-Hauptsturmfuehrer (Captain, Elite Guard) DOETZER

Previous attempts for simultaneous protective immunization with a combined serum against several infectious agents have been successful several times, first by CASTELLANI and later by RAMON. There was little incentive for developing a simultaneous active immunization against several infectious agents in Germany because of the high standard of hygienic conditions, apart from the fact, that the doctrine of competition of the antigens has retarded the employment of combined immunization material. Conclusive proof regarding influence on immunity through the administration of different immunizing agents has not yet been produced, so that the concept of competition of the antigens cannot be used to minimize the results of practical experience with combined agents. The limit in employment of combined agents may not be found in the competition of the antigens but in the too violent reactions caused by the administration of increased quantities of antigens.

The testing of tolerance to combined agents for that reason appears to be of foremost and decisive importance concerning its use. The testing can only be of value when done on human beings. We have therefore tried out, on a number of persons, the toleration to a new tetravaccine against typhoid, paratyphoid A and B and against cholera. The vaccine was placed at our disposal by the Behring Werke, Marburg (Op. 194 212, active until the 18 December 1945). The vaccine was clear, slightly opalescent without coarse particles and contained, according to information furnished by the producer:

in 1 cc. = 500 millions of typhoid bacilli  
250 millions of paratyphoid bacilli A  
250 millions of paratyphoid bacilli B  
2 billions cholera-vibrions.

Injections with this vaccine were performed at intervals of 7 days and were given alternately under the skin of the right and left chest between the nipple and the collarbone in doses of 0.5, 1.0 + 1.0 cubic centimeters. Altogether 250 healthy, well nourished men doing heavy work were vaccinated.

The tolerance to the vaccine was evaluated according to the local and general reactions and for details follow up examinations of the vaccinated men took place on the 1, 3, 5, 7, 13 and 20th day after vaccination.



Examinations showed marked local reactions in only about 50 per cent of the men following the 2nd and 3rd injection. There was no essential difference between the 2nd and 3rd injection. The local reactions generally lasted about three days and rarely longer than five days. Reactions occurred most frequently on the first day. The reactions conformed throughout with those observed with vaccination using TAB (Triple typhoid-paratyphoid) vaccine. No special inconveniences were observed with general reactions. No increase in temperature took place. The capability for work was not impaired in a single case.

In summary it can be stated on the bases of observation on 250 men, that the tolerance to the tetravaccine against typhoid, paratyphoid A and B and cholera (producer Behring-Werke) is in no way different from the tolerance to TAB, used up to now, and that there is no objection to its employment on a greater scale.

## 2. Tolerance to new typhoid, paratyphoid A and B vaccine.

### SS-Sturmbannfuehrer (Major, Elite Guard) GROSS

On the basis of observations on 1000 men the tolerance to a new endogen adsorbed vaccine against typhoid, paratyphoid A and B produced by the Behring Werke was studied. The vaccine had been produced through a special procedure bringing into solution typhoid and paratyphoid A and B bacilli. The resulting endogen had been adsorbed by aluminum hydroxide. The final endogen concentration in 1 cubic centimeter was equal to an amount of endogen obtained from

500 million typhoid bacilli  
250 millions paratyphoid A bacilli  
and 250 millions paratyphoid B bacilli.

The content of aluminum hydroxide in this vaccine amounted to 10 per cent.

The vaccine was injected underneath the skin of the chest, strictly subcutaneously at intervals of 14 days in a strength of 0.5 cubic centimeter at the first injection and 1.0 cubic centimeter at the second and third injections.

The 1000 men selected for the vaccinations had an average age of 25 years and were in moderately well nourished condition.

200 vaccinated men (group 1) were under daily medical observation. Reactions of the second group of 800 men (group 2) were observed every second day. The figures appearing in this report are based on results of evaluations of the first group, to which we might add that the results were about the same in both groups.

In estimation of reactions a differentiation was made between general and local reactions.

Fever was slightly more frequent than other symptoms of a general reaction. Repeated measurements of temperatures gave the following picture:

Injection:	I	II	III
Subfebrile temperatures (above 37.5°C.)	3.0 %	4.5 %	5.0 %
Temperatures above 38° C.	5.5 %	15.0 %	2.0 %

Elevated temperature was found mainly during the first two days.

Other appearances of general reactions were observed only individually as the following records show:

Injection:	I	II	III
Exhaustion	1.0 %	2.0 %	0.5 %
Headache	8.5 %	11.0 %	9.0 %
Chills	3.0 %	11.0 %	9.0 %
Pain in limbs	1.5 %	1.0 %	2.0 %
Pain at site of injection	2.5 %	2.5 %	6.0 %

In evaluation of the local reactions following injection two phases could be made out: the acute inflammatory stage from the 1st to the 4th day and from the 6th day to the stage of depot resorption. The first phase was marked, with the exception of reactionless cases, by a reddening of the skin around the site of injection as early as 3 to 4 hours after immunization. This reddening showed small infiltrates and also a certain tenderness to pressure (50 percent) particularly after the second and third injections. According to frequency and size we could observe 4 different groups of reactions, namely reddenings with an average diameter of 2x2 cm., 4x4 cm., 7x7 cm. and larger.

After the first injection the reactions with an average diameter of 2x2 and 4x4 cm. were seen in about equal numbers. Only an infinitesimal part of the reactions had a diameter of 7x7 cm. after the first injection. Reaction sizes of 4x4 and 7x7 cm. were more prevalent with the second injection in contrast to the smaller reactions with the first injection. The third injection produces about an equal distribution of all sizes of reactions.

The numerical proportions of all observed reactions of all sizes on the second day after injection were:

I injection	II injection	III injection
69.0 %	91.0 %	74.0 %



The phase of local accumulation (depot resorption) was recognized by the fact that reactionless infiltration developed of 1x1, 2x2 and 3x3 cm. in size from the sixth day after the injection which persisted up to 8 weeks and did not cause any inconvenience to the immunized men. Infiltrated areas with a diameter of 1x1 cm. and 2x2 cm. were observed in that order of frequency. Larger infiltrations were less frequent.

The observation showed, that the number of cases of infiltrations increased from injection to injection and reached the highest point with 79 per cent of all vaccinated persons 4 weeks after the third injection. In a small number of cases reactionless infiltrated cords developed which extended from the site of injection toward the armpit. Also small sterile abscesses, which were reabsorbed in a short time were seen. Reactionless swelling of the lymph glands, up to the size of a bean were also observed in the corresponding armpit.

The differential blood count showed an insignificant deviation from the normal.

Within the group of 200 men the O-agglutination, according to GRUBER-WIDAL, showed a certain rise of titer in a small number of cases against typhoid as well as against paratyphoid. The highest titer of 1:200 was reached in the 7th and 8th week after the 1st injection (8 per cent and 8.5 per cent respectively).

Absence from work on account of the immunization was small and coincided with the day of injection and the three days following with few exceptions.

There were unable to work of	group I (200 men)	group I and II (1000 men)
1st injection	2.0 %	1.5 %
2nd injection	7.0 %	1.8 %
3rd injection	2.5 %	0.8 %

It can be stated in summary that the typhoid, paratyphoid A and B adsorbed vaccines of the Behring Werke with the Op. No. 284 212 as used in these experiments, is certainly tolerated well in every way when used with the dosage employed here. At the present, nothing can be said concerning the protection given by this vaccine in case of exposure to these diseases.



### 3. Experimental trial of a new typhoid vaccine.

Flottenarzt (Fleet Surgeon) Prof. RUGE

Efforts to produce more potent typhoid vaccines than the ones existing and trying to get along with just one injection have been studied for a long time. GRASSET especially has occupied himself with these problems and by all appearances produced a very effective vaccine. His procedure was to open up the typhoid bacilli through a repeated freezing and thawing process, leave the emulsion alone for several days at about 37° C. and then centrifuge it, after which the remaining liquid was treated with Formalin in order to attenuate any toxic substances. According to his reports, quite a number of persons have been vaccinated with one injection of this vaccine with rather good results which were at least equal, if not superior, to those of the threefold injection with the customary vaccine. Others have later simplified the production of the vaccine omitted the addition of Formol and claim, nevertheless, to have had just as good immunization results.

With existing work as a foundation, I have occupied myself for the last 12 years with this problem with the aim in mind to produce an adsorbable vaccine that would avoid reactions produced by Formalin. For the destruction of the typhoid bacilli I have employed, just like GRASSET, a repeated freezing and thawing process (freezing at minus 80° C., thawing at 56° C.) and then putting the emulsion into the incubator. Further experiences showed, however, that the freezing and thawing process was not necessary at all in order to destroy the typhoid bacilli and that it was sufficient to let it stay at about 37° C. The dregs at the bottom were centrifuged off and the remaining liquid cut with aluminum hydroxide. The vaccines produced in this manner were concentrated and for injections had to be diluted in a ratio of 1 to 10. In experimental trials on animals with the present vaccine, titers for O and H up to 1:50 000 have been produced. The vaccine was satisfactory and did not produce any local irritations. Trial immunizations on human beings resulted in the same picture.

On the basis of work done with Vi-Antigen I proceeded later to use a whole series of typhoid strains for the production of the vaccine. I have highly virulent cultures, which were freshly isolated from large epidemics, which have been passed through the mouse and then used for the production of vaccine. I have not been able to find remarkable difference in the several groups. Finally, I used only a single strain and one Vi-culture. The latter culture I employed for the reason that one finds in it the most important factor for immunization. On the basis for a long series of experiments, regrettably interrupted by external circumstances, I have adopted the following working procedure:

The emulsion is centrifuged, the sediment is removed and diluted with distilled water, put into the incubator and left there for some time. The first liquid is treated with aluminum hydroxide, the residue washed out and preserved as a concentrate in Phenol-NaCl. Concurrently with



this, Vi-dialysate is produced from a good Vi-culture in the customary manner. 20 per cent of this dialysate is added to the vaccine. Experiments on rats, undertaken according to the system of BIELING although with only one injection resulted in the rats surviving a dose 40 times the minimal lethal dose 16.5 f, d.l.m. The rats were killed later and were examined bacteriologically for possible viable bacilli. On only a few cases among the surviving rats could the presence of typhoid bacilli in the spleen be proved but never in the intestines or blood. Of course, the infection was performed with a heterogenous culture. Only the shortage of animals prevented me from experimenting on a larger scale.

In order to make use of all the available mass of bacilli dialysates have been produced even out of the residues of the bacilli treated with distilled water. They also showed the property of agglutination. On the other hand it has also been tried to obtain antibodies, if possible, from the remains of the dialysates of the Vi-culture.

In the course of examination it was determined, that in the production of vaccine one has to watch out not only for the composition of the single strain of bacilli, but that the relative weight of the component parts also plays an important role. It is therefore necessary to weigh the bacilli and to make up a corresponding combination accordingly. The behavior of the residual nitrogen and the composite protein gives a reliable clue to go by.

At the present time I have advanced so far that only an evaluation of the results of experiments on animals is necessary. After that, no obstacles are presented against experiments on human beings.

#### 4. Adsorbate vaccines against scarlet fever and diphtheria.

Stabsarzt (Captain, MC.) SCHMIDT-BURBACH

In consideration of the many evidences of good results with adsorbate vaccine for diphtheria this consultant advises its employment on adults in the campaign against diphtheria. For adults up to 30 years two doses of 0.2 cubic centimeter each at an interval of 4 weeks are recommended.

Vaccines made of streptococci, according to GABRITSCHEWSKY and those made from native toxins according to DICK may be considered obsolete today. After ANDO and collaborators have determined through analysis of the culture filtrates of haemolytic streptococci that the specific erythrogenic exotoxin can be separated from the non-specific, allergically active nucleoprotein, then the question is raised, whether only the pure erythrogenic scarlet fever toxin obtained through alcohol precipitation should be used for the DICK reaction as well as for the



production of the vaccine. Adsorption of this toxin by aluminum hydroxide will yield a vaccine producing an effective protection with 2 to 3 injections with well tolerated reactions. This consultant wishes to emphasize, that the appearance of strong reactions always has to be considered as a symptom of high grade susceptibility toward scarlet fever. In these cases the same dose should be injected again and not the next higher one. The protective vaccination against diphtheria and scarlet fever can also be combined through the employment of adsorbate vaccines. In order to do this, two vaccinations with the double vaccines must be performed at an interval of 4 weeks.

An analysis of the reactions should be made in order to determine, whether the reactions observed on the individual patient were caused by the portion of the vaccine against diphtheria or by that portion against scarlet fever in order to be able to draw final practical conclusions about continuing the vaccination.

Discussion on the lectures about combined and adsorbate vaccines.

SCHREIBER: Of utmost importance in this discussion is the question if it will be possible to introduce to the Armed Forces the vaccines against typhoid, paratyphoid A and B and cholera, examined by MRUGOWSKI. Tolerance to this vaccine is hardly different from that to the vaccine TAB. It is not yet determined, how the agglutination titers will behave after vaccination against typhoid, paratyphoid and cholera. Taking favorable results for granted, one can, for obvious reasons, not draw final conclusions about the usefulness of a vaccine from the increase of agglutination titers alone but can consider the behavior of the titers only as a hint, - then I would have no objection against the unconditional introduction of this vaccine in order to save our soldiers one injection, namely the vaccination against cholera with reference to the initial and also the booster vaccination. I beg you, when drawing up directives on the future scheme of vaccinations, to keep in mind, that in this fourth year of the war it is of really no little importance whether there are more or less vaccinations than heretofore.

ROSE (to DOETZER): The results of these examinations affirm the correctness of the system in use by the Tropical Branch of the Robert Koch Institute for the last 6 years, that is to inject simultaneously with the normal dose of vaccine against typhoid and paratyphoid, in the same hypodermic syringe with 2 billions of cholera vibrios. All vaccinations had been well tolerated. No increase of reactions above those observed with vaccinations against typhoid and paratyphoid alone took place. On the other hand, the commercially available combined vaccine, containing only 500 millions cholera vibrios in 1 cubic centimeter must be rejected, as this small number of vibrios seems to be insufficient to produce immunity against cholera. It is suggested that we refrain from the use of the name Tetra-vaccine in the Armed Forces for this vaccine but rather to name it in such a way that even the troop physician



inexperienced in immunizations can unmistakably recognize it for what it is. In other words, to speak of a vaccine against typhoid, paratyphoid A and B and cholera. It is advised, that the place on the body for injection also be studied in future examinations of this kind about tolerance to certain vaccines. As a rule for the German Armed Forces protective vaccinations against typhoid and cholera have to be administered under the skin of the chest, as contrasted to spotted fever which is given under the skin over the deltoid muscle. The latter spot for vaccination is generally preferred in foreign countries. The opinions, on which site the local reactions are of greater inconvenience to the vaccinated persons, are divergent. A decision on this question, through careful comparison, is urgently desired. The location should be determined, on which site the acute inflammatory reaction and the longer lasting permanent infiltration of the adsorbate vaccines would be the least inconvenient.

(To RUGE): The immunization with a single injection, if possible without any reactions, is an old desire of all hygienists and especially of all persons about to be vaccinated. Whether it ever can be realized with employment of non-viable agents or with toxins derived from them, must be doubted according to all present knowledge. We know, that the kind and mass of antigen alone are not of decisive importance for the degree of possible protection. Of greater significance are the repeated stimulation and the interval of time between the injections. The interval of 7 days, customary in the German Armed Forces, is at the same time in no case the best choice from the point of view of immunization, but it has been forced on us out of practical considerations as in most cases a longer period of time would lead to an incomplete execution of the vaccination.

(To SCHMIDT-BURBACH): Through the pressing into the service of the airforce helpers of extreme youth there have come under the hygienic care of the Armed Forces, age groups which we, with the exception of the Preparatory Military Schools, never had to consider before, neither in the Armed Forces nor in the State Labor Service (Reichsarbeitsdienst). In regard to the increased hazard to these groups through scarlet fever and diphtheria, the Medical Inspector of the Airforce ordered the general protective vaccination against those two infections. The vaccination with the combined vaccine against diphtheria and scarlet fever will be divided into 5 injections which are to be given at intervals of 14 days each. Nothing can be reported yet concerning the epidemiological results of this measure, as it has been in progress too short a time. However, it is worth mentioning, that several medical stations had to report such severe reactions that they discontinued, on their own initiative, the completion of the ordered vaccination. Of course, these severe reactions have not been observed in general, so that we have to keep in mind the possibilities of mistakes in dosage. At any rate, these observations admonish one to be cautious in further proceedings. We object especially to recommending for the Armed Forces at the present time, the simultaneous vaccination against scarlet fever and diphtheria in a single



injection. It is desirable to collect a greater amount of experience, with less sensitive age groups in the civilian sector before one continues in this manner with the Armed Forces. Of course, particularly careful supervision of single experiments is to be desired. The prejudice against the protective vaccination against diphtheria for adults is based not only on experience made by immunizing nursing personnel but also of similar observations made in immunizing student teachers. In addition to that there is the fact, that in spite of stronger reactions experienced by adults, the immunity conferred through vaccination against diphtheria appears to be smaller with adults than with the more youthful groups. I suggest adopting the principle, that generally for protective vaccinations in the Armed Forces and when various strengths of vaccines have to be injected, at each vaccination date, that these various doses, exactly as in protective vaccinations against cholera and diphtheria, be issued in different volume rather than in doses of different concentrations. Different volumes will eliminate the danger of confusion of concentrates, which happens in practice again and again although in theory it seems so easily avoidable. If there were in use only a single vaccine of standardized concentration its supply and availability would be facilitated. To the question of General (MC.) Professor SCHREIBER, in regard to the position taken towards passive immunization through serum, it has to be reported, that in the Airforce the passive immunization with heterogeneous serums against diphtheria and scarlet fever has been forbidden in principle. The motive of this prohibition is the consideration, that the passive immunization has apparently a well merited place only in pediatrics. Under military conditions the exposure can seldom be removed within the short period of protection obtained by the use of the serum and on the other hand the susceptibility of those age groups which do interest us is considerably less than in childhood. Furthermore, experience has taught us that those reactions appearing after employment of prophylactic serums, invalidate more of the troops than the sickness itself. Serious serum sickness, yes, even cases of death, have been the consequences of the employment of prophylactic serums. Finally, there has to be taken into consideration, that in wartimes an unnecessary sensitization of the soldier against serum has to be avoided, as the possibility of an injury at any time has to be taken into account, which in turn would necessitate an injection of tetanus serum. It would be desirable if other parts of the Armed Forces would follow the example set by the Airforce.

CLAUBERG: Efforts to simplify vaccination methods through the combination of the antigen and adsorption of the same on aluminum hydroxide, in order to obtain vaccine depots in the tissue with a delayed resorption process, are to be welcomed. At any rate, all the new kinds of combined vaccines have to be examined immuno-biologically for immunization and supported by experience. Advance information never could be given regarding the possible mutual benefits on the one hand or the possible hindrance of the effectiveness of a certain vaccine. Expectations of success



from the so much desired single injection should not be raised too high. In my own investigations (in collaboration with SARTORIUS) the vaccines proposed for single injections among them Sublimate, Lipo and Endo-Anatoxin-Precipitation vaccines, came off second best almost always when compared with bacilli suspensions of the related kind employed under similar conditions and which are in general use at the present time. One will hardly ever get along without the repeated immunization stimulating doses. In my latest examinations concerning protective vaccination against diphtheria in adults, the use of a minimal dose of vaccine i.e. 0.1 cubic centimeter adsorbate has proved to be sufficient. The reactions fortunately were small and the success of vaccination extraordinarily good. In regard to older persons, perhaps with those above 35 years, one should get along without the protective vaccination against diphtheria altogether. If epidemic conditions should force upon us a different attitude then 0.1 cubic centimeter anatoxin will suffice for these age groups. The basic immunity against diphtheria present in the adults of our population as an expression of latent permeation of the infection can itself be stimulated with the smallest dose of antigen, as the negative results of the Schick-test convincingly prove through the simple expedient of its repetition. For that purpose the above mentioned dose of unadsorbed toxoid is sufficient which, by the way, will be more speedily resorbed and therefore promises a speedier success. Because of the serious reactions observed in cases of immunization with the combined vaccine against scarlet fever and diphtheria a re-examination of the generally rough, empirically stipulated dose should take place. Especially the lately used quantities of antigen seem to be rather high and not without objection. One will have to keep in mind that antigen doses and antigen effect do not stand in proportional dependency to each other but rather follow the binominal function, i.e. one never succeeds in obtaining more than the optimal effect through increased doses of antigen. For that reason it is necessary to determine that dose which finally must be chosen anyway, and which would not need to be exceeded in order to bring about the desired effect.

HORNUNG: Three things seem to me to be of importance:

1. Dose: It should not be greater than is absolutely necessary.
2. Location: I prefer a vaccination into the chest to a vaccination into the upper arm, because the latter is more in motion.
3. Interval: 8 days are too short a time as examinations in Marburg have shown. The organism has to have time to build up antibodies. The importance of longer intervals are also shown by experiences of the French with the injection de rappel, the so-called "recall" injection.



WAGNER: Combined vaccinations against diphtheria and scarlet fever had been executed in a submarine training division in such a way, that between the injections of the protective vaccine against diphtheria occurring at a 4 week interval a vaccination against scarlet fever was inserted, so that a 14 day interval between the single vaccinations could be maintained. Owing to a careful choice of dose, there was no increase in vaccination reactions to be observed. The sudden decrease of incidence of both sicknesses in the above mentioned naval unit speaks for the success of this procedure.

RODENWALDT: With regard to this question, I beg of you to take into consideration the experiences of the Dutch with vaccinations with tetra-vaccines of the Mecca pilgrims. For the last 15 years the pilgrims have been vaccinated with tetra-vaccine and the resulting experiences have been splendid.

KROEGER: Since October 1942 all new entries in the State Labor Service (Reichsarbeitsdienst) have been vaccinated against diphtheria and scarlet fever right from the start, exclusively with adsorbate vaccine. No statement can be made at present about the results of these vaccinations and their epidemiological effects as the necessary particulars are only collected just now. In reference to tolerance to the vaccine, which seems to be of interest to all of you the following can be said however: The exceptions against vaccinations for scarlet fever taken by UHLENHUT and the scruples mentioned by ROSE against the employment of combined vaccines because of their severe secondary symptoms in contrast to the ones experienced with the vaccination against diphtheria, alone or rather with the divided protective vaccination against diphtheria and against scarlet fever cannot be concurred with. If UHLENHUT recommends the limitation to the well tried protective vaccination against diphtheria and its safely controllable secondary effects, then we have ascertained in thousands of cases of simultaneous vaccination against diphtheria and scarlet fever, that, if there have been incidents at all, they have occurred in connection with the vaccination against diphtheria and not with that against scarlet fever. During the past half year of winter we have tried out the combined vaccines against diphtheria and scarlet fever in several thousand vaccinations in two labor districts (Arbeitsgauen). Since differences in the degree of tolerance, in comparison with the divided vaccinations had not been noted in the reports, the order was given, that with the beginning of April of this year, all fresh draft groups have to be vaccinated with the combined vaccine. Up to now no reports have been received from other districts in regard to especially striking symptoms during the progress of vaccinations.

UHLENHUT: I surely may assume, that the vaccinations with tetra-vaccine against typhoid, paratyphoid A and B and cholera were performed on soldiers who had not been vaccinated before. I would be interested to hear something more definite about the results of the Vidal-Reaction with



regard to the effects of the single components of the vaccine on it. With reference to the combined vaccination against diphtheria and scarlet fever, the statements by ROSE about more serious reactions seem to be noteworthy. We certainly do possess a very excellent vaccine against diphtheria and also a well tolerated and effective vaccine against scarlet fever. I would like to recommend especially the vaccine by FARAGO. At any rate, it must be avoided under any circumstances that a less easily tolerated combined vaccine should bring into discredit the well tried vaccine against diphtheria. I do doubt, that there is an urgent necessity for a combined vaccine against diphtheria and scarlet fever, nevertheless, it is my opinion that the experiments, within the State Labor Service should be continued.

Directions for immunization against typhoid, paratyphoid A and B and cholera.

The combined vaccination with TAB vaccine has proved its value. It gives protection simultaneously against typhoid, paratyphoid A and B. It has been proved that it is possible to add to that vaccine the vaccine against cholera without changing in the least its degree of tolerability. The effectiveness of the single components is not reduced by it.

Each vaccination has to be performed flawlessly. It is to be considered as a surgical operation. For each candidate about to be vaccinated, a sterile needle has to be used. Used needles have to be boiled. A sufficient number of the right kind of needles should be available in advance.

The injection has to be given strictly subcutaneously between the nipple and clavicle. The spot for injection has to be disinfected first. With intramuscular injection more serious reactions have to be expected. The intervals between the single injections are 7 days. These periods of time must not be shortened. It is better to aim at a lengthening of these periods in order to give the body more time to produce immune bodies. The immunization of new draftees therefore has to commence immediately.

Each complaint about the tolerance to the new vaccine or about affected health condition due to vaccination has to be investigated personally by the troop physician and the results are to be forwarded through the usual official channels.

By the 1st of March the troop physician has to inspect all records of the soldiers and to ascertain, whether all prescribed vaccinations have been received and to administer later on those which are missing.

Directions for the simultaneous employment of typhoid, paratyphoid A and B, and cholera vaccine.

1. In consideration of the many necessary protective immunizations a reduction of the number of individual injections is desirable.
2. This aim is to be accomplished through the use of combined vaccines.
3. For this purpose a well tolerated combination vaccine against typhoid, paratyphoid A and B, and cholera is being produced (TAB Chol.)
4. Its dosage and administration is in accordance with the previous customary procedure i.e. injections of 0.5, 1.0 and 1.0 cubic centimeters at intervals of 7 days.

A re-vaccination of 1.0 cubic centimeter is to be performed 6 months later in the months of March and September.

5. In case of outbreak of cholera, the pure cholera vaccine and not the combined one is to be employed, because it contains more agents and therefore promises a better effect.

B. Directions for protective vaccinations against diphtheria and scarlet fever.

I. General.

The protective vaccinations with adsorbate vaccine have particularly well shown ~~their~~ value in the fight against diphtheria and scarlet fever. Their use is recommended therefore to the Armed Forces, in epidemics as well as for protective vaccinations.

During the performance of the protective vaccination against diphtheria and scarlet fever, certain special precautionary measures have to be observed concerning the dosage and especially the technical performance of the vaccination. (Refer to III later).

Immunity is attained only a certain time after vaccination.

A full effect of the protective immunization is to be expected only 2 - 3 weeks after the 2nd injection.

Inasmuch as the adsorbate vaccine against diphtheria does not contain animal protein, it may be employed unreservedly even after previous serum administration.



### Details of the protective vaccination against diphtheria

The observance of the prescribed interval of at least 4 weeks between the two necessary injections is important (see II), as the resorption of the depot of the first injection is finished only after about 3 weeks and only with the beginning of the 4th week is the most propitious time for a good immunizing effect of the second injection.

There are no objections against vaccinations during an epidemic of diphtheria. The intervals of time between the injections are not to be reduced in spite of cases of this sickness appearing.

In cases of severe reactions after the 1st diphtheria injection the 2nd may be omitted.

After a recently recovered diphtheria sickness no protective diphtheria immunization is necessary. There are no objections against the injection of other vaccinations between the 1st and the 2nd diphtheria injections, e.g. protective vaccinations against typhoid.

A simultaneous vaccination against diphtheria and smallpox must be avoided.

### Details of the protective vaccination against scarlet fever.

With regard to the protective vaccination against scarlet fever, the observance of the indicated intervals of time is also imperative, but, in contrast to the protective vaccination against diphtheria, the intervals of time are not to be lengthened under any circumstances.

A vaccination during an epidemic of scarlet fever is also possible. The protective vaccination is not required after overcoming an attack of scarlet fever itself.

Concerning vaccinated persons with more serious reactions after the 1st injection, the second injection is to be performed with the same dose as the 1st injection (see under dosage).

It is possible that scarlatinous exanthemas may appear in a few cases following the protective vaccination against scarlet fever. They are a sign of a particularly susceptible individual towards scarlet fever. For that reason a re-vaccination of these candidates is unquestionably necessary.

## II. Dosage.

### a. Protective vaccination against diphtheria.

Vaccines: Diphtheria Toxoid Asid or ALFT of the Behring Werke.

Dose: Young people up to 21 years receive 0.2 cc. twice of either vaccine.

Adults over 21 years receive 0.1 cubic centimeter twice with an interval of at least 4 weeks between the injections. Adults over 28 years of age in general do not have to be vaccinated with the exception of Medical Officers and Medical Personnel.

b. Protective vaccination against scarlet fever.

Vaccines: "Scarlatox Asid" or "Adsorbate vaccine" against scarlet fever, of the Behring Werke.

Dose: "Scarlatox Asid" given 2 or 3 times, each time 1 cubic centimeter of concentrations I, II and possibly III at intervals of 2 weeks.

"Adsorbate Scarlet Fever vaccine" from the Behring Werke: 3 times, 1 cc. each time, with an interval of 2 weeks between the injections.

III. Vaccination technique.

In order to avoid undesired reactions and injury due to immunizations the following particulars are to be observed when administering immunizations.

1. The presently used vaccines against scarlet fever and diphtheria are depot vaccines which, for slowing the resorption process, have been adsorbed by aluminum hydroxide. Therefore everything that might lead to a speed-up of this resorption process has to be avoided, e.g. a dilution of the vaccine with physiological sodium chloride solution by which too large masses of antigen suddenly pass into the body which in turn would be strengthened but would have to react without a simultaneous increase of the production of antibodies.
2. It must be observed strictly that the vaccine is deposited underneath the skin (below the raised skin-fold) and sufficiently distant from the point of injection. In this manner a backflow of the vaccine along the injection canal will be prevented, which might produce more serious reactions and the growth of sterile abscesses. Intra-muscular injection results also in an undesired speeding up of resorption with its already mentioned subsequent symptoms.
3. Caution has to be observed, especially in mass immunizations, to strictly adhere to the correct dosage, as for instance, a slight increase from the prescribed dosage of vaccine in diphtheria immunizations may lead to quite serious reactions.
4. Hypodermic syringes and needles have to be sterilized by boiling: rinsing with or soaking in alcohol or any other chemical disinfectant solution is not sufficient.



5. As for the immunizing biological effects of the inoculation itself, the part of the body chosen for injection (upper arm, chest, abdominal wall) is of no significance.
6. Empty vaccine bottles are not to be used for any other purposes.

B. Vaccinations against typhus.

5. Result of a trial with a variety of typhus vaccines against classical typhus.

SS-Sturmbannfuehrer (Major, Elite Guard) DING

Among the vaccines for active protective immunization against typhus, obtained from non-viable agents and in use by the German Army and the German civilian administration in general, only that vaccine produced from the intestines of lice has proved its usefulness in experiments on human beings.

In order to test the tolerance and the protective effects of vaccines obtained from egg membranes, lungs of rabbits and dogs, equal sized groups of male persons, who up to that time had never been in contact with typhus, were put under observation. Equal sized groups of people, sick with typhus, but who had not been vaccinated for protection were also observed.

The following vaccines were tried:

1. Vaccines derived from the intestines of lice, according to WEIGL;
2. Vaccines derived from egg membranes, according to GILDEMEISTER, HAAGEN;
3. Two vaccines of different strengths from the Behring-Werke, produced according to the revised method of OTTO and WOHLRAB. These vaccines are not employed today any more;
4. Vaccines produced from the lungs of rabbits, according to the method of DURAND-GIROUD;
5. Vaccines produced according to the system of COMBIESCO and collaborators from the lungs of dogs.

The tolerance to all of these vaccines was satisfactory. No hindrance for performing the usual work was observed. The fever was reduced through the protective immunization, the duration of the fever was shortened by about a week when compared with the duration experienced by non-immunized persons. The immunization with vaccines by WEIGL, GILDEMEISTER and GIROUD, produced from pure Rickettsia prowazeki strains,

showed particularly favorable results. This immunization prevents death in the majority of cases. It does not seem to reduce, however, the frequency of this disease.

The protective vaccination was of no influence on the reduced blood pressure, although it lessened considerably the participation of the central nervous system in the immunized groups in contrast to the non-immunized persons.

The exanthem did not become hemorrhagic with the immunized group and it disappeared on the average one week earlier than in the non-immunized comparison groups.

6. Results of a trial with a variety of typhus vaccines against North and West African forms of typhus.

Marinestabsarzt (Lieut. MC., Navy) Prof. NAUCK

Apart from the "classical typhus" transferred by lice, there exist in North Africa two other forms of typhus, transmitted through fleas, "rat-typhus" and the exanthematous "tick typhus".

The dominant form of typhus in North Africa does not cause epidemics of such proportions as experienced in Eastern Europe. It is less a question of serious local outbreaks and rather one of having the appearance of a more general spread among the people which, under favorable conditions, produced a considerable increase in the number of sick persons. Since 1937/38 an increase in the number of sick persons in Morocco, Algiers and Tunis has been observed. At the end of 1941 and at the beginning of 1942 another rise in figures of considerable proportion occurred.

Immunization experiments with live vaccine, on a large scale, were undertaken in Morocco and Tunis during the last pre-war years, especially with employment of less virulent murine strains, whose pathogenicity had been further reduced through a special procedure (attenuation by cattle bile and mixing with egg yolk or olive oil). For practical use only the new methods of BLANC (with bile treated virus of fleas) and the method of LAIGRE-DURAND (mouse brain) come in question which, in comparison to former methods, possess only minor hazards. In spite of this live vaccine cannot be recommended for our combat troops in Africa, as the effects of it in practice have not been ascertained yet with a sufficient degree of certainty.

For the production of non-vital vaccines the use of North African strains is suggested, as non-vital vaccines possess a comparatively limited immunizing ability and because the quantity of vaccine, produced according to the method of WEIGL and employed successfully in the production of vaccines in Abyssinia, is not sufficient to fill greater demands. The preparation of vaccines from the primary egg-membrane of fertilized hen eggs is to be advised. It seems possible



that the form of classical typhus which prevails in North Africa is more closely related to murine typhus than to the typhus prevalent in Eastern Europe. It might be worth investigating if murine strains, which have the advantage of being easier to culture, could be used in the processing of vaccines for North Africa. With that possibility in mind, there would be given at the same time an increased protection against sporadic outbreaks of rat typhus. In how far a protection against exanthematic tick fever would be accomplished also cannot be decided as yet, because practical experience in this regard is still missing.

#### Discussion about typhus vaccines.

ROSE: More impressive than the numerically expressible effects of typhus immunization on the progress of the disease are the personal observations at the bedside and the much more favorable general condition of the vaccinated patients. The most important result of the examination is the observation that an equivalent degree of immunity cannot be obtained through vaccination, as is produced through a natural infection. The influence of the vaccination on the progress of the disease, especially the prevention of a fatal outcome, is a potential gain and represents an improvement which we could hardly expect from a vaccine obtained from non-vital agents. After the uniformity of results of typhus vaccination has been determined for vaccines produced by various methods, it is our obligation to concentrate our efforts upon those vaccines which, with the least expenditure of men and material, possess comparatively the highest volume production, in order to close the gap which still exists today in covering our requirements. The observations made by EYER, that a toxin could not be proved in experiments with lice rickettsias on animals, are of themselves no arguments against the employment of vaccine obtained from lice intestines. But the also demonstrable presence of toxin in vaccines derived from egg yolks is not to be considered valid. On the other hand, clinical observations of vaccinated persons show, that the different vaccines are all equivalent in regard to their toxicity and in the production of more severe reactions and the protective effects achieved. Undue importance should not be placed on certain types of *Rickettsia prowazeki*. One should not forget in this consideration that even if vaccination is carried out with a different type of *Rickettsia*, *Rickettsia murina* for example, a cross immunization against *Rickettsia prowazeki* of practical importance may be obtained. With regard to the naming of the various typhus vaccines in the directives for use in the Army, it is recommended that the names of the different producers be omitted and only names describing the material be used: vaccine from lice intestine, egg yolks, mouse lungs, etc. etc. It has to be pointed out also, that the louse vaccine, frequently credited to WEIGL, goes back originally to DA ROCHA-LIMA. WEIGL's work is rather in the field of further technical developments and the practical employment of the vaccine.



EYER: 1. Those vaccines, processed according to presently recognized methods, are all useful, inasfar as the producers use the necessary care during their production.

2. Different cultures of *Rickettsia prowazeki* differ among themselves. Therefore it is advised, just as with other vaccines, to employ, if possible, numerous *Rickettsias* originating from different localities. Besides polyvalent vaccines, special purpose monovalent vaccines have to be produced from currently active epidemic cultures, e.g. for North Africa, employment of cultures of the strain "Tunis *Rickettsia*", which from all appearances may be considered a type between *Rickettsia prowazeki* and *Rickettsia mooseri*.

3. Even though typhus vaccines should be rich in *Rickettsias*, one should not have the idea that there is no limit to this requirement, because there are optimal concentrations above which an increase will not produce greater effects. With regard to louse intestine vaccines, this optimum remains between 50 and 100 intestines of lice.

4. The vaccination performed at three separate dates, produces better results than the single vaccination. The interval of time between the single vaccinations should be at least 8 days, the concentration of each dose should be increased and not equal every time. Apart from this, trial experiments with vaccinated and, later on, artificially infected human beings show very strikingly the high value of the vaccinations performed at three different dates.

5. Experiences with vaccines from louse intestine of German origin prove conclusively, up to the present there have been more than 1 million vaccinations, that the rate of mortality among the vaccinated persons could be reduced to 1/3 of the rate occurring among the non-vaccinated.

6. The assumption by HAAGEN, Strassburg, that the protective effects of Fl. (flea?) vaccine seem to be anti-toxic in nature has to be accepted. This cannot be deduced, however, from the results of an examination by GILDEMEISTER and HAAGEN about the degree of toxicity ascertained during the production of the vaccine from egg membranes, as *Rickettsias* from louse intestines are not toxic to mice and still they immunize very well.

RUGE: According to reports made by medical authors of the Navy, the vaccine, which is produced there, does not prevent with certainty the contracting of an infection. The progress of the disease, however, runs a lighter course. No fatalities have occurred up to the present time. The vaccine is very well tolerated.

RODENWALDT: Only one question for Professor NAUCK: I may be mistaken, but I seem to remember, that the effects of vaccinations, performed by the French on natives in North Africa, have been much better than those experienced on Europeans. What is the explanation?



SCHREIBER: We have been informed through the lecture by DING, which of the presently used typhus vaccines are of approximately equivalent value. They are those which we have employed for a long time already. It is of importance at the present time, that we make up our minds, which of the equivalent vaccines can be massproduced the most easily. In the coming winter, we will be in need of great quantities of vaccine, and the more we have, the better it is. I beg of you when composing the directives, to keep that in mind and to give preference to that vaccine which can be produced most easily in great quantities. In my opinion it will be the vaccine derived from mouse lung.

UHLENHUT: Has the effect of the convalescent serum undergone a critical examination as regards its healing and protective power during experiments on human beings which apparently have not produced fundamentally different results? It would be interesting to know the effects of the convalescent serums in a combined trial (serum vaccination). If one could produce live vaccine, avirulent to human beings, as in the system employed for the production of vaccine against yellow fever and smallpox, then the protective effects might be materially improved as experience indicates that live vaccines are more effective than non-vital ones. At the present time, it seems we are able only to prevent death. This kind of experiment is necessary. For the time being we have to hold on to non-vital vaccines.

Directions on typhus immunizations.

1. The following vaccines, when expertly produced, are useful and equally good in application for protective immunization against typhus:

- a. vaccines from the intestines of lice,
- b. vaccines from egg membranes,
- c. vaccines from the lungs of mice,
- d. vaccines from the lungs of rabbits.

All of these are good, provided that they are produced from different, if possible currently epidemic strains of *Rickettsia prowazeki*.

2. Every institute, ordered to produce typhus vaccines, has to investigate, which production system will yield the best results in regard to quantity.

3. Apart from the yield of any system, the actual local conditions for obtaining culture substrata and animals for experiments and the supply of food for the animals are of decisive influence in the choice of any manufacturing plan.

4. It is desired, in cases of initial immunization against typhus, that the up to the present decreed interval of 8 days between the first and second and the second and third injection be lengthened to 10 to 14 days, provided that the time element is available.

7. Immunization against yellow fever.

Stabsarzt (Captain, MC.) Prof. HAAGEN

The different methods of protective immunization against yellow fever will be discussed and reports will be given about our own experiences with the scarification vaccination performed according to the system of PELTIER and collaborator.

8. Urban yellow fever and jungle fever.

Stabsarzt (Captain, MC.) Prof. HOERING

Both of these diseases are identical in clinical and bacteriological respects and differ only in epidemiological considerations. Originally, yellow fever was a disease confined exclusively to monkeys living in jungles; and which might have been carried back into human surroundings by human beings who had been infected themselves in the jungle (vector: jungle mosquito) and from where it had been transferred still further by *Aedes aegypti*. In epidemic districts of Africa, yellow fever is a children's disease which frequently is not recognized clinically as yellow fever and in this way continues to exist on a permanent basis. Real jungle fever without *Aedes aegypti* has never been proved in Africa but its existence has to be taken for granted as yellow fever is a natural monkey disease also in Africa. The present situation, with regard to yellow fever in Africa, is influenced by the great epidemic of 1940 in the Sudan (Ruba Mountain) as well as by the fact that the U.S. Armed Forces found themselves under obligation to perform vaccinations on their troops on a large scale which fact has been ascertained from reports of about 25 585 cases of yellow fever (with 62 fatalities) among U.S. soldiers through post-vaccinal icterus simplex.

Discussion about yellow fever.

ZSCHUCKE: Why has the use of a combined vaccination with performance of the protective vaccination against smallpox, as recommended by French authors, been refused. This is supposed to:

- a. increase the protective effects against yellow fever, according to the French,
- b. save one vaccination because, on account of increased danger of infection through smallpox, each soldier is mandatorily vaccinated before his transfer to Africa as a protection against smallpox anyway.



Answer:

- a. The supposed increase of protective effects against yellow fever have not been verified in our own experiments.
- b. Since every soldier is vaccinated against smallpox on entering the German Army, a later re-vaccination is superfluous.

EYER: Correctly produced vaccines against yellow fever can be kept potent for 2 years when they are stored at plus 4 degrees Celsius. In working with a neurotropic mouse brain virus the danger that a foreign virus causing jaundice might be introduced is smaller than by employment of weaker culture of Soper (D 17) in combination with human serums, which method seems to be preferred by the Americans.

HOERING: Answering ZEISS: The possibility of importation of epidemics to Southern Europe exists today just as well as it existed during the last century because *Aedes aegypti* is to be found over all Southern Europe (also there is the possibility of importation through airtraffic).

With reference to the remarks by HAAGEN: With regard to cases of jaundice occurring after yellow fever vaccination, examinations of corresponding cases, undertaken before the war, have proved this assumption an impossibility for the reason that many of the vaccinated persons sick with jaundice (always after a long incubation) had acquired even at the beginning of their jaundice high titers of protective agents against yellow fever in their blood.

With regard to the question from EYER: The vaccine, employed by the Americans, appears to have been the vaccine 17 D derived from egg cultures and produced by the Rockefeller Institute. On account of these experiences, all serums have been omitted with the result that every occurrence of jaundice was stopped immediately in every case. The identity of these vaccination cases with our own cases of hepatitis epidemica is questionable, however. Against this assumption is the fact that no contact infections originating from any of these 25 585 cases in the U.S. Armed Forces could be observed.

Directions for prophylactic vaccination against yellow fever.

1. In connection with the prosecution of the war in yellow fever infested Africa i.e. coastal cities as well as the interior and virgin jungle, the German troops are to be considered as exposed to the danger of yellow fever.
2. Since the same virus is the cause of all the so-called different types of yellow fever and since it also produces the same clinical picture of the disease itself, immunization against yellow fever fulfills its purpose to protect against any infection of yellow fever type.



3. The method of choice for the German Armed Forces is the percutaneous vaccination with cerebral mouse virus in the customary manner employed against smallpox. There are no objections against a simultaneous vaccination against smallpox.

4. The vaccination should be performed before transfer into yellow fever infested zones takes place, if possible already in Germany.

D. Venereal diseases.

As a part of the proceedings of the Consultants's Committee on Hygiene a discussion took place with participation of dermatologists, about the campaign against venereal disease. Reports were given by Flottenarzt (Fleet Surgeon) GRUNSKÉ and Oberstarzt (Colonel, MC) Prof. LOEHE, which resulted in the establishment of certain directives. Their inclusion in this report is not necessary. They will appear in the form of directives.

E. Other questions pertaining to our particular branch.

9. The treatment of diphtheria carriers.

Stabsarzt (Captain, MC.) HERTEL

The significant position of diphtheria carriers with regard to diphtheria epidemics is sufficiently well proven. The treatment of the diphtheria carrier is necessary because the active protective vaccination can never produce full effects on account of its manner of injection and its limited effectiveness in general, whereas the treatment of diphtheria carriers can be considered as a preventive attack on the outbreak of the disease at its veritable source.

All attempts of treatments undertaken up to the present are to be considered as futile. Locally acting chemotherapy as well as non-specific irritation therapy (X-rays, ultra-violet rays, protoplasma activation) and specific, active mediums (lysates, vaccines) biological procedures (bacterial antagonism) and operative methods are unreliable in the attempts to remove the germs. Results of our own experiments have verified these opinions. All in all 907 diphtheria carriers have been treated. A certain new remedy, different in composition and producing different effects, attains success in only 84 per cent of the treated cases. This permits the assumption that every method of treatment, which is based solely on effects produced by preparations, will fail. Observations of untreated diphtheria carriers points out the causal connection of pathological changes of the upper respiratory passages and the persistence of the bacillus.



Through the means of smear examination, rhinoscopy, X-ray examination and the ascertainment of type, disease conditions of all kinds in various degrees of severity in the upper respiratory passages, pharynx and accessory sinuses will be found in every case of saprophytic bacilli. These conditions render the treatment more difficult. In two cases specific suppurations in the maxillary sinus could be detected. Through employment of the previously mentioned extract derived from plant matter as a medium of disinfection a method of treatment can be developed which is elastic in its application, depending on the findings in pathological and anatomical findings in the upper respiratory passages and therefore has to be adjusted strictly according to the individual case. It combines local, rhinological treatment, locally applied disinfection by mediums of the most diverse variety and variable, operative procedures, (rinsing and disinfection of cavities, tonsillectomy). The most stubborn cases among diphtheria carriers were successfully cleared up in this manner. Later examination of 83 diphtheria carriers after their discharge proved only in one case, which had been considered negative, the continued presence of diphtheria bacilli.

Special directives for the treatment of diphtheria carriers are not required. For the clearing up of these carriers, in as far as it seems warranted, the taking into consideration and the removal of any possible changes of pathological and anatomical nature in the upper respiratory passages, including the accessory sinuses, is necessary. Concerning chemotherapy, the employment of the Lacuprins, at present under investigation in several army hospitals, is to be recommended in which case the nasal treatment, besides tampons covered with ointment, has to consist of rinsings of the nose with a watery solution (1 to 15) and purposeful spraying of the channels in the nose in order to be useful.

#### Discussion:

UHLENHUT: The most exact examinations of HERTEL are of extreme importance especially since all previous attempts at clearing up diphtheria carriers have not led to any positive results. I have occupied myself repeatedly with this problem. Because killing the bacteria in the crypts of the tonsils and in the upper respiratory passages by disinfecting mediums applied externally seemed to be of extreme difficulty, we have developed, right at the spot, iodine in a nascent state by gargling potassium iodide and an acid  $H_2O_2$  solution but also without success (MUENCHMEYER). The use of Ozone was also futile.

Lately, trials with antiformin solutions have been undertaken in a reserve hospital in Freiburg. At my suggestion, in cases of wound-diphtheria, compresses with a 2 per cent solution were made through which (under bacteriological control) favorable results were obtained in several cases. Antiformin possesses, as is known, a dissolving effect on bacteria and neutralizes the toxin. Besides, it stimulates the granulation process in the wound in a particularly good manner (C. f. Bakt. XLII Berichte Klin. Wo. 1908, 29). Failures, however, will occur because of the difficulty of the problem.



RUEHL: A hint concerning the necessity for a differentiation of types. The entire scheme for clearing up diphtheria carriers should be employed only against the pathogenic forms.

BACHMANN: A Russian method of treatment of diphtheria carriers is up for discussion which consists of treating diphtheria carriers through a stay in gas chambers filled with diluted chlorine gas. This method, employing chlorine in the weak solution of 1 to 200 000 has been re-examined by HETTCHE in trials on a limited number of diphtheria carriers who had remained positive for the previous 2 to 3 months. In spite of several sittings with increased time of exposure only two out of twenty diphtheria carriers taking part in these experiments became negative. A final opinion is not yet possible. For the treatment of diphtheria carriers a stay in fresh air or a change of climate is considered of great importance which corresponds with the experience of pediatricians. With more than 300 diphtheria carriers of a reserve-division in the West for instance, good results were produced through their transfer in one camp and their employment with moderately heavy work in the open air. With these soldiers diphtheria bacilli were proved only up to 4 weeks. In persistent cases of diphtheria carriers determination of type is necessary. Without hesitation diphtheria carriers with type mitis can be adjudged fit for military service.

CLAUBERG: The suggestion for an anatomical cure of the upper respiratory passages of diphtheria carriers is valuable and ought to be taken to heart, particularly in cases of persons inclined to become chronic carriers in need of frequent disinfection. To employ this method unconditionally, as the consultant advises, is however, a demand that goes too far and which is, because of the considerably wide distribution of carriers, neither practicable nor, with regard to their different importance in epidemiological respects, necessary. As an encouraging sign it is recorded in the discussion of this theme that efforts also from clinical representatives, have been made to identify the different types of diphtheria bacilli in order to recognize the dangerous and the usually practically harmless strains of diphtheria bacilli. The realization of this will materially simplify the fight against diphtheria.

#### 10. Ridding carriers of intestinal protozoa.

Oberstabsarzt (Major, MC.) Prof. HAUER

All intestinal protozoa in question will first undergo a review as to their occurrence, the question of their pathogenicity and the causal treatment will be considered briefly. A prominent importance, also in wartime, is to be ascribed to the E.-histologica. Besides it, the attack of the rare, only as single cases of contact infection, balantidium coli appearing, as well as lamblia intestinalis deserve special attention. The rest of the protozoa are practically apathogenic and require special consideration and eventual treatments only when occurring in severe forms. Yatren appears to be the best treatment available.



The cure of amoebic dysentery will be discussed later in detail. It is divided into the treatment of the clinical amoebic dysentery and (under circumstances following it) the cure of the avirulent enteritis. The latter disease, usually without symptoms in clinical respects, represents the main source for the distribution of amoebic dysentery. The best remedy employed up to the present is yatren which also may be dispensed in combination with rivanol tablets. More definite information will be given about a new remedy against amoebic dysentery, WIA, an arsenic acid-bismuth combination, which has been tried out on 122 cases of enteritis during the last year and which has produced splendid results. It is probably superior to yatren in regard to tolerability and effects against minute forms and cysts. Therefore it seems to be an ideal remedy for the cure of carriers of amoebic dysentery. It is without effect only against the virulent kind of amoebic dysentery but in combination with emetine, all five cases of amoebic dysentery clinically treated up to the present, have been healed and cured, which should presage a simplification of treatment in many cases if these experiences could be verified on a large scale.

#### Discussion:

ROSE: The introduction of an Army order to treat all obscure cases of diarrhea, in countries infested with amoebic dysentery, with yatren for the first three days, is emphatically warned against. Without taking any position concerning the question of whether this method is appropriate for countries in which the amoebic dysentery represents the main problem, it must be emphasized that in all of the presently important theaters of war, amoebic dysentery is of secondary importance when compared to bacillary dysentery and certain other infectious intestinal diseases. Of main importance is bacillary dysentery. Concerning its treatment, sulfonamides have proved themselves valuable during the last two years in such a way that we must advise our troop physicians to give preference to these preparations in questionable cases of diarrhea. The recommendation for the use of yatren for the same purpose would only create confusion and uncertainty and therefore would be harmful.

Concerning the treatment of lambliosis, my own good experiences with Arcranil as well as TEITGE's excellent results through employment of it, in many cases should be pointed out.

FISCHER: Your attention is called to inflammations and abscesses of the liver which occasionally occur, even many years after an amoebic infection and are not easily recognized as such. I saw such a case after a 20 year absence from the tropics. It is of importance to know that this kind of disease can run its course without producing fever, as is shown by one case which had been diagnosed for a long time as carcinoma of the stomach and where only the autopsy revealed an abscess in the left lobe of the liver which had broken through below the diaphragm (observation by Professor LIBSCH, Munich). Every soldier, discharged from a hospital with endemic amoebic dysentery,



(North Africa, Southern Italy, Balkans, especially Greece, the South of Russia) ought to be given, on the subsequent appearance of any intestinal disorder which does not disappear when treated in the usual manner, a thorough examination by tropical specialists. That applies as well after discharge from the Army. Only in this way can the continued existence of such intestinal infections and their sequelae, as have been observed after the first World War and up to the present time, be avoided.

Directions for ridding carriers of intestinal protozoa

1. Among the intestinal protozoa, the dysentery amoeba takes the most prominent position. Dysenteric diseases caused by balantidium occur only as rare, always solitary contact infections. In exceptional cases lamblia intestinalis can produce symptoms of entero-colitis. The remaining intestinal protozoa are harmless.

2. Treatment of clinical amoebic dysentery, caused by virulent amoebae should be according to the method outlined in the circular letters of the Medical Service of the Army. The cure of the so-called avirulent enteritis is undertaken either through employment of yatren or entero-vioform (3 doses of 2 pills or tablets per day for 7 days). If need be, the cure is repeated.

3. Lamblia intestinalis is to be treated with atabrin or acranil if obtainable (for 5 days, 3 doses of 1 tablet each day).

4. All drugs are to be taken only under supervision.

11. The threat of malaria to the German population through returning soldiers.

Oberstarzt (Colonel, MC.) Prof. RODENWALDT

During the war of 1914 - 1918 tens of thousands of carriers of malarial gametes returned from the Balkans, Turkey and Russia.

The fear, that these reservoirs of virus might be the starting points of renewed, epidemic appearance or endemic new-infestations of malaria in Germany proved to be without foundation. ROCHT was correct in his assumption that Germany is no longer one of the countries able to produce malaria epidemics.

The reason for it is the reduction of the density of anopheles in Germany, through agricultural works, to such a degree that a transfer, even with the existence of many carriers of gametes, seems to have become unlikely.



Attention is directed to an article by MARTINI, "Epidemiologie der Malaria", in which a computation is given about the improbability of malaria infections under such conditions.

Measures to ward off malaria, undertaken in a certain military district, were therefore unnecessary and it is not right to claim the absence of infections as being the result of those measures.

Of course, anopheles still find breeding possibilities all over Germany in limited biotopism. Therefore anopheles have been found wherever one searched, as in the military district referred to above and it goes without saying and there was no reason to publish this self evident fact.

Even if especially hot summers and regions with only small cattle farming might increase the possibilities of transfer above the usual odds mentioned, an epidemical appearance of malaria or re-appearing endemics are to be precluded in Germany.

#### Discussion:

WAGNER: In spite of the small calculated possibility that malaria may spread over Germany on a larger scale as just reported, clinicians at least have to take into consideration the occasional occurrence of malaria of local origin. In Danzig, a few days ago, a sample of blood taken from a child admitted shortly before into a children's clinic was shown to me and it contained, besides numerous sexless plasmodia, gametes. The child came from a small village in the neighborhood of Danzig, the lowlands of the Weichsel. Inasmuch as malaria has been extinct for many years in the lowlands of the Weichsel, investigations pointed to a worker from the East from near Charkow who had been employed on that particular farm since August last year as the source of the infection. Examination of his blood has still to be taken. It is quite possible that the infection took place in the very hot latter part of last summer and that the disease came now, after the well-known latent stage, to an outbreak.

FISCHER: As an example of the small danger to our country, it is pointed out that BAUMANN, in investigations undertaken on my suggestions in Wuerttemberg after World WAR I, could ascertain only four locally originating cases of malaria among which there was one not determined in parasitological respects and one tropical case.

HAUER: Inasmuch as the previous speaker has mentioned the subject, I should like to remark in addition, that I know of quite a number of locally originating malaria infections among the German civilian population. During this war a schoolboy from Berlin with an ostensible sepsis was brought to me which proved to be a tertiana duplicata. The patient had never left Germany and had returned from West Prussia where he had spent his summer vacation. Investigations with the help of the county physician proved that



malaria was practically unknown in that particular district and that the infection might have been transmitted by Rumanian workers, sick with malaria, who had been employed there for some time. Anopheles were present. Before the present war, I had been informed by a physician, a native of Emmerich, that several cases of tropical malaria had occurred in the region of the Netherland-Rhine canal system, of which one case (that of a child) ended fatally. To all appearances, the infection having probably gone out from ships which might have brought along their tropical malaria from the Belgian Congo. In other respects, however, the detailed statements of Oberstarzt (Colonel, MC.) RODENWALDE are of a fundamental nature.

BACHMANN: If prophylactic treatment against malaria is no longer permissible that is contrary to the directives concerning malaria issued by the Army Medical Inspectorate in 1942 in which a complete treatment of soldiers, coming from countries infested with malaria, is permitted at the beginning or the end of the season for infection. Information about this point is requested in order to know how to act.

ROSE: The fundamental interpretation that a practical hazard to our country through parasitic vectors of malaria does not exist and will not develop for reasons of entomology and climate may be concurred with by all specialists of this branch. However, I want to point out that, for several years already, through the presence of prisoners of war and foreign workers within the Reich, there is present a larger number of carriers of plasmodia than could possibly be expected through homecoming soldiers of the Armed Forces even under the most unfavorable circumstances. Since 1939 as result of the enactment of the law that every case of malaria within the Reich has to be reported, we already have evidence with regard to the consequences produced by the mere presence of these foreign carriers in Greater Germany. Even taking into consideration the unavoidable incompleteness of any of these reports, observations made during the last years have unquestionably proved that transmission has taken place only in single cases and at the worst only very small numbers have been taken sick. These actual observations are more reliable proof of our interpretation than the best calculation of possibilities. Furthermore, I do point out that through the transfer of people of German descent from the East, populations of entire villages of Bessarabia and the Dobrudscha, infested to a high degree with malaria, have been transferred to and settled within the Reich in rather closed communities. In other words, in these cases one has to consider not only the density of the anopheles. With regard to epidemics, there has taken place a rather unfavorable concentration of carriers which ~~was not~~ have to expect through the returning soldiers of the Armed Forces. In spite of this, according to observations so far, a reestablishment of centers of malaria such as we have in East Friesland, Upper Silesia and the southern part of Steiermark, has not occurred. With regard to preventive measures to be recommended to individuals in Germany in



order to avoid infections, we point to the pamphlet issued by the department of health and the Robert Koch Institute as well as to an article by ROSE (Deutsches Aerzteblatt 1942, No. 16 pages 182 to 185). With reference to the infections in the lowlands of the Weichsel, mentioned by Professor WAGNER, I should like to remark that we have still to figure, especially in the neighborhood of the Weichsel, with the persistence of older cases of malaria. I personally know of three cases in the vicinity of Bromberg, occurring in 1939 which certainly might have been traced to local sources of infection. Polish statistics about propagation of malaria in this district may not be considered as reliable information.

Opinion concerning the threat of malaria to the German population through returning soldiers, prisoners of war, etc.

Germany is, on account of the small density of anopheles no longer suitable for the development of malaria epidemics.

A hazard to the health of the population through the danger of a re-infestation or the increase of malaria infections through returning soldiers or prisoners of war sick with malaria, or through carriers of gametes among them, does not exist therefore. Measures to ward off such a danger are superfluous.

12. Field latrines in subtropics and tropics.

Kriegsverwaltungsrat (Special Administrative Consultant) Dr. VICK

The covering of the faeces with sand is an insufficient measure of expediency. A sure protection against flies and hookworms is to be accomplished only with a covering of 22.5 to 90 centimeters. The removal of faeces by means of containers, which would have to be emptied, should be employed only in exceptional cases. Privy ditches, which ought to be narrow but deep, are useful as temporary expedients but require some device to keep out the flies. The boring of a hole of about 40 centimeters diameter and to a depth of more than 5 meters, to be used as privy, is of great advantage. A disadvantage is the necessity of having a boring device. Strongest recommendation for the satisfying of the needs of our troops by using smoke latrines which are easy to assemble, simply and rapidly with usually locally available means and which offer complete protection against flies. For more important, larger installations, intended to last for a longer time and in case of a reliable and sufficient water supply, simple water closets with provision of chambers for filthy matter, come into consideration.



Latrines by borer, smoke latrines and water closets should be preferred to ditches and bucket privies, because they are not dependent to such a degree on closures. The most important requirement with regard to latrines is the regular care of them. Important centers of traffic should be supplied with the most sanitary latrines. In contrast to the general principle that all field latrines should be built only with locally customary means, the use of special trained construction personnel recommends itself.

#### Discussion:

RODENWALDT: The supervision of field latrines through personnel, especially trained for that purpose, is imperative. During epidemics in World War I, the placing of containers with disinfectants at latrines guarded by special guards to watch that every one leaving the latrines washed his hands in them was of great value. The pole privy, even though liked by the troops, is unquestionably objectionable and should best be forbidden. However, during the last weeks, I have still seen it being used by our troops all over Sicily and Sardinia, even now the source of a serious tormenting plague of flies. A better care of hygienic conditions at railroad stations through special personnel, to work with local personnel, is unquestionably necessary. Such personnel were assigned during the war at all R.R. stations in Turkey and were called disinfection personnel. Their tasks were the provision and good care of waiting rooms and lodgings, the supplying of drinking water of satisfactory quality, the erection and supervision of decent latrines, and the cleaning up of areas around the stations.

HORNUNG: A serious source of propagation of epidemics are the railroads. Even in our country in peacetime, the removal of faeces by railroad personnel is a very great deficiency. The admonition, not to use the toilet during stops in stations is of doubtful value. One can observe that best, for instance, during winter when there is icy snow between the railroad tracks. It is still worse, for example, in railroad stations in the East. For hours and even days, trains remain frequently at a standstill outside on end sidings and all faeces fall on the gravel. Then it happens for instance, that soldiers, detailed to fetch the food supplies, wade through this and later put their boots into the baggage net next to their army bread. Hospital trains, filled with soldiers sick with typhus, are of especially great danger in such cases. Officers, in charge at stations ought to take care also for the removal of excrements in the areas of end sidings. Chloride of lime must be made available.

SCHREIBER: I should like to direct the attention of hygienists to the conditions in railroad stations. I can only underline the statements made by the previous speaker Oberstarzt (Colonel, MC.) HORNUNG. The latrines there are not at all of sufficient numbers and the most evil conditions result from large troop movements and particularly from transports of prisoners of war. Suitable field latrines in sufficient numbers must be built. The thorough cleaning



up and continual caretaking of railroad stations and their immediate surroundings is, however, of utmost importance. Within the area of an army corps as well as within the area of an army, hygienists have to direct their particular attentions continually toward the control of these conditions.

HAUER: If only for historical reasons alone, the splendid results of our field latrines as well as of our smoke latrines, which we had during LETTOW's campaign, (Africa, World War I), deserve mention at this time. The troop, as is known, had marched thousands of kilometers, changed its position daily for months on end and then again remained in the same position for months, sometimes near a river. After certain improper conditions at the start of the war had been eliminated, our latrine system was the object of a very strict discipline. With regard to epidemics, the latrines for the main body of the negroes were of particular importance. A sanitary orderly, an Askari, was posted at the deep, long trenches at all times who had to watch strictly that every one, immediately after evacuation of the bowels, covered the excrement with sufficient ash or soil. In this way, conditions in our privies remained excellent and the dreaded plague of mosquitoes was reduced to a minimum. Constructed for the first time in the Cameroon in 1913 and used by us in East Africa shortly before the First World War, smoke latrines were very welcome to us especially in the rear of the front at hospitals, as well as in camps for native porters and they proved to be of great value. The fact that in a smoke privy no mosquito or mosquito eggs could possibly exist was of particular importance. Unfortunately, troops on the march had to forego the erection of smoke latrines.

RONNEFELDT: Points out the great extent of Russian railroad stations which makes difficult the use of latrines during nights and during overcrowding of stations. For that reason, officers at railroad stations should be held responsible for maintaining satisfactory hygienic conditions at their stations. Sufficient local personnel is at hand for this kind of work.

ROOSE: It must be particularly emphasized, that the maintenance and care, as well as the continual supervision of latrines, is of decisive importance. The troop units must employ a permanent latrine service in order to establish without doubt and at all times the party responsible for the hygienic conditions of those latrines. That troops on the march or in bivouacs cannot erect permanent latrines is obvious. However, if a stay is to last more than 24 hours, the provision of latrines with satisfactory hygienic conditions, has to be arranged. In this question, troops must not be left to themselves and their own ingenuity. This point is so important for their health that they must be supported through supply with suitable materials and devices and must be taught by instructions (directions and blueprints). "A walk with the spade" is just an euphemism for a general soiling of the area. The finding that a 20 centimeters high covering of faeces is not of sufficient reliability is important. I have verified in the East, that even thick layers



of soil above corpses could not even prevent the development of carrion maggots and their subsequent changing into flies. I found deficiently made graves covered with heavy layers of empty and also with undeveloped maggot grubs of carrion flies. I support unconditionally the demand by RODENWALDT for a prohibition of the pole privy. It is especially the open privy trench, with the pole or without it, against which we must fight. In spite of all theoretical advantages of "squatter" latrines, practical experiences have proved that the German does not know how to use it expertly. I have not found yet one "squatter" latrine, used by German troops, in satisfactory sanitary condition. Concerning protection against flies, the problem of an automatically closing lid has always produced the greatest difficulty. Closing devices, bothersome to users, are quickly destroyed. A recommendable, practical solution presents a model introduced to the Airforce which works the locking device not from the top but from the bottom. The slanting seat is firmly connected at a right angle with the locking device. In order to use it, the seat must be pressed down. Hereby the lid is opened. After use, the seat raised itself and the lid closes from below. This model has the advantage that the seat does not get soiled by urination. This is a very important point in latrines in which special urinals are missing, as is often unfortunately the case in spite of orders to the contrary. Necessity of camouflage and lack of fuel in other places sometimes advises against the use of smoke latrines.

UHLENHUTH: During World War I, much experience has been collected about field latrines. Latrines with "riding seat" equipped with lids to cover the openings as protection against flies have been of recognized value. Naturally, the erection of satisfactory hygienic latrines depends also on the kind of warfare (trench war or war of movements). In the tropics, faeces deposited freely in the open, are made harmless in a very short time through the process of dissolution. Covering with soil is a simple medium. In the discourse I have missed a reference to the important point of cleaning of the hands, that is disinfection of the hands which we enforced in trench warfare even in the most advanced positions. Continued control is necessary.

#### Directions for field latrines in tropics and subtropics.

The possibility of erection of latrines depends naturally upon the length of the stay of a troop unit in a certain place and the location of the place itself. With consideration of these limits observation of the following directions is necessary:

1. Troops, staying in one place longer than 24 hours, have to build latrines according to orders.
2. Blueprints of latrines of recognized value as well as instructions about the use of material for construction of the same are to be distributed to the units via official channels and besides through the official medical channels to troop physicians for their enlightenment.



3. Erection, maintenance and care of latrines is the concern of the units whereas the job of the troop physician is the supervision of sanitary conditions in the latrines.

4. Burying of faeces is not protection whatsoever against hookworms and against flies, except when the soil covering the faeces is more than 20 centimeters. The manner of covering, performed with the so-called spadewalk, is only a temporary emergency solution which is to be replaced by all means through the building of proper latrines (see 1).

5. As an emergency solution, the using of non-transportable, old gasoline barrels or any other barrels can be recommended. Seats and covering lids have to be provided for such improvised expedients. Emptying of filled and therefore no longer usable barrels in a proper manner is necessary (burying).

6. The removal of faeces by means of buckets, barrels and pails, which would have to be emptied regularly, may be used only in exceptional cases and when there is no other possible solution. When still in containers, faeces have to be covered with sand, or still better, with lime-water; a regular emptying and cleaning of containers is necessary and a disinfection desirable.

7. Plain holes in the ground, to be used as latrines for a limited space of time only, are sufficient and serviceable. The holes ought to be as deep and small as possible, ought to be protected efficiently against flies and the seats must have covers to keep out the flies for certain. Ventilation, without giving access to flies, has to be provided for.

8. If a borer is available, making bored hole latrines suggests itself, which, with a diameter of about 40 centimeters ought to have a depth of 5 meters and more. Borers, answering this purpose, are to be provided according to plan.

9. The use of smoke latrines is particularly to be supported, especially where consideration of camouflage and the supply of fuel permit their employment. Smoke latrines offer, according to experience, an absolute protection against flies. They are of particular advantage when several privies can be put up above one hole. It is sufficient to keep the smoke fires burning during the day. Blueprints and instructions for smoke latrines have to be provided for the troops,

10. Plain holes, borings and smoke latrines, which are not watertight, ought to be put up in such a way that no drawing of water takes place within a radius of 30 meters.

11. In the rear areas, water closets, whenever possible at all, are to be preferred as the most suitable type over any other kind of latrine. In their construction, unobjectionable removal of filthy fluid has to be taken into consideration. The size of the lay-out for filthy fluid must correspond to the usage of the latrines. The units are to be provided with blueprints, instructions for erection and upkeep of these plants.

12. Devices, certain to keep out flies, are unquestionably necessary for container latrines, bored hole and pit latrines and are desirable for smoke latrines and water closets. The closing device ought to be tolerant and trustworthy; automatic closing devices are favored if they fulfill these conditions.

13. It is desirable that special personnel are assigned for construction of latrines at main traffic lines to satisfy the needs of great numbers (bored hole, smoke latrines, water closets with chambers for filthy fluid). After erection of these larger plants which are to be used by transient units and single persons, it always has to be settled which locally established office carries the responsibility for maintenance and care of them.

14. Conditions in railroad stations, particularly outside of our borders, deserve our special consideration. Unobjectionable latrines in sufficient numbers and logical distribution are to be put up (latrines with seats for Germans, "squatter" latrines for members of allied military forces, local populations and auxiliaries). For the part of the army, military officers at railroad stations are to be held responsible for the erection of and the sanitary conditions in latrines as well as for cleanliness of the station area. Daily removal of excrements, deposited outside of latrines, has to be undertaken as the making use of latrines, even when present in sufficient numbers, is not always to be taken for granted (violations of orders, too long distance from troop transport trains in overcrowded stations, hospital trains). Those in charge of groups are admonished to enforce the use of latrines and to take disciplinary measures in case of violations. In principle, military police at stations remain responsible for clean conditions and the removal of waste matter. Chloride of lime, watering-cans and containers for mixing of lime-water are to be made available.

15. In hygienic respects, the "squatter" latrine is theoretically of greater advantage than the latrine provided with seats but the expert use of it cannot be expected from members of the German Army because of lack of experience. For that reason the latrine with seats is to be preferred for Germans.



16. During cooperative working with groups of people used to different latrines, their strange latrine habits are to be taken into consideration and the foreign people have to be provided with a sufficient number of latrines corresponding in construction to the ones they are accustomed to.

17. The maintenance and supervision of latrines is just as important as the choice of a practical and proper construction type. An arrangement of a continuous latrine service within the units is to be insisted on at all times. A single cleaning during a day is not sufficient. There must be no doubt at any time whatsoever who is carrying the responsibility with regard to the condition of strictly maintained cleanliness in the latrines.

18. It is recommended to provide in the immediate neighborhood of latrines a possibility for washing the hands or cleaning the hands with a disinfecting liquid, e.g. a 2 per cent solution of Lysol.

13. Evaluation of the serological test for lues in regard to its diagnostic value with omission of Wassermann's reaction.

Professor JAHNEL

Undoubtedly, Wassermann's reaction can be dispensed with in examination of blood. It is advisable to employ several flocculation reactions, especially MEINICKE's clarification test II and either the KAHN test or the citochol reaction (resp. MUELLER's (Rudolph) agglutination test). The lentochol reaction according to SACHS-GEORGI and the MEINICKE turbidity test are less sensitive but possess a good specific character. With omission of Wassermann's reaction, the employment of two more sensitive methods, such as MEINICKE's clarification test II, KAHN test, citochol reaction and also MUELLER's agglutination test comes into consideration, is recommended in addition to one of the mentioned, less sensitive methods.

Positive reactions to lues tests, sometimes of particular severity, are not always caused by syphilis. Injections of serum of different types (tetanus, diphtheria, etc.) can produce at times, but not always, positive reactions to lues tests, especially to MEINICKE's clarification test II, MUELLER's agglutination test and to intralumbar injections of meningococci serums even in the spinal fluid.

Positive lues reactions, sometimes, of particular severity, appear in a certain form of bronchitis and also in cases of malaria the latter of which I had the opportunity to examine, in collaboration with FISCHER, in a large number of cases in the hospital for tropical diseases in



Munich. MEINICKE's clarification test II seems to be frequently negative in cases of bronchitis. In cases of malaria a positive result of this test is relatively seldom seen, which occurrence might also occasionally happen to the lues test. In spite of that, a negative MEINICKE clarification test, when reactions of other lues tests have been positive, can give a hint about the non-specific nature of the disease.

The false, positive reactions usually subside within a few weeks without further lues treatments. During the progress of other diseases, temporary positive lues reactions are also observed at times, usually in less intensity in cases of scarlet fever, herpes simplex, ulcus molle, and lymphogranulata inguinalis. Positive reactions of a more severe degree may occur with monocytic angina, endocarditis lenta, leprosy and of course with frambesia, which is very closely related to lues. According to the literature, they are supposed to have been observed also with recurrent fever; in cases of North African recurrent fever (cases in the hospital for tropical diseases in Munich Professor FISCHER), positive lues reactions in serum were not observed by us. In case of doubt, repeated blood tests at not too short intervals and examination of the spinal fluid are recommended. Positive serum reactions should give special cause for inquiry into the history of the patient with regards to facts about syphilis and symptoms of the disease itself should be taken into consideration. Furthermore, the fact that syphilitics may contract other diseases is to be taken into consideration (eczema, tuberculosis, tumor of the brain, etc.).

Requested remarks from Stabsarzt (Captain, MC.) SCHROEFF  
with reference to the previous discourse.

With regard to the question of judgement of the diagnostic value of flocculation reactions, the tabulated results of 17 000 examinations, undertaken lately, of all flocculation reactions will be exhibited, which permitted the ministerial order concerning the serum diagnosis of syphilis, dated 17 August 1942, with inclusion of the complement fixation reaction, the particular significance of which consists in the fact that the same serum had been employed with all methods.

With regard to questions about the sensitivity, specificity and non-specificity of a certain method, they lead to the following observations:

1. The MEINICKE clarification test II is doubtless not only the most sensitive reaction but also the most specific reaction because it produces the strongest reaction results in all stages of lues. Its disadvantage consists in the fact that it possesses also the largest non-specific reaction rate.



2. Outside of the field of technical and optical sources of errors, i.e. the doubtful reactions in our studies, the SACHS-GEORGI reaction has no non-specific reaction rate. In cases of lues II, III and lues latent, it possesses a 100 per cent specificity even though the latter does not show similarly strong reactions as the MEINICKE clarification test II. It is the least sensitive reaction and fails therefore in untreated cases of lues in a ratio of 1:33 when compared to the MEINICKE's clarification test II.

3. Between the degree of sensitivity and the non-specific incidence of these reactions we find all other methods with various degrees of strength but yet with sufficiently exact specificity for the single stages of lues.

Observations of the various methods considering their specific and non-specific reactions discloses a certain important relationship, i.e. corresponding reactions upon specific as well as non-specific events. That holds especially for the relations of MEINICKE tests among themselves and as well, as already discussed by Professor JAHNEL, for the KAHN test and the citochol reaction.

The above described observations yield the practical and logical conclusions:

1. that the MEINICKE clarification test II as well as the SACHS-GEORGI reaction ought to be the basis of any combination of flocculation reactions;
2. that only KAHN's test, the citochol reaction or MUELLER's agglutination test come into consideration as a possible third additional reaction. Under field conditions, the agglutination test proves itself too difficult of execution in technical respects.

#### Discussion:

BLUMENBERG: Points to the fact that the disclaiming of Wassermann's reaction has been caused solely by non-scientific circumstances. Particularly for evaluation, this reaction produces splendid results. The percentage of non-specific, positive exanthemas with spotted fever is very minimal as compared with the not inconsiderably high ratio occurring with flocculation reactions.

CLAUBERG: The omission of Wassermann's reaction which I proposed at one time, has been in the meantime justified through experience gained in 50 000 serological tests undertaken in my institute with the use of flocculation reactions alone. Even in case of rare, in the beginning not serologically determined cases, there was no need to make use of the Wassermann reaction. The same goes for proof of lues in the blood as well as for the detection of lues in the spinal fluid. Through examination of our material, in collaboration with clinicians and advisory councilors, it has been proven in addition that the third flocculation reaction, requested by the office of the Minister of Interior

for the civilian sector as a substitute for Wassermann's reaction (in order to clarify questionable cases) is not unconditionally required. We get along very well with two flocculation reactions only.

UHLENHUTH: If Wassermann's reaction cannot be employed under wartime conditions because of technical difficulties and one must limit oneself to the MEINICKE clarification test and the lentochol reaction, then I still maintain the view that Wassermann's reaction should not be considered obsolete. For decades Wassermann's reaction has proved its value and ought to be employed again when conditions are normal. It must not be brought into discredit. For a diagnosis, which involves such a great responsibility, one ought to make use of all recognized methods in doubtful cases.

Directions for the serological diagnosis of lues.

1. With renunciation of Wassermann's reaction, the serological diagnosis of lues must be undertaken in every case through:
  - a. use of the complete MEINICKE clarification test II,
  - b. the lentochol reaction.
2. Interpretation of results of both reactions shall be made according to degrees of strength  $\frac{+}{+}$  to  $++$  by which too keen differentiation should be avoided.
3. The informing of the sender about the results of both reactions has to be performed in the following manner:  

$\frac{+}{+}$	=	doubtful (undecided)
$\frac{+}{+}$	=	positive
$++$	=	strongly positive
4. With regard to clinically or serologically doubtful cases a repetition of the test after an interval of 2 or 3 weeks is necessary. For a satisfactory judging of the results of the reaction, a careful filling out of the covering letter accompanying every blood sample, by the physician, is imperative.
5. The same directions, 1 to 4, apply to the serological proof of lues in spinal fluid.



14. The standardization of cerebro-spinal fluid diagnosis in the hygienic laboratories.

Stabsarzt (Captain, MC.) SCHROEER

The standardization of spinal fluid diagnosis is important for the following two reasons, which are:

1. without standardization, a useful basis for adjustment of claims for pensions as well as fitness for service in the war, cannot be established and
2. because without standardization the admonition to conserve in wartime especially with regard to concentration of material and personnel, cannot be adhered to.

It appears necessary first of all that in order to accomplish this purpose, all methods, pertaining to spinal fluid in so far as they do not find a better and more suitable procedure right at the bedside, should be carried out and supervised by the same people in the same location and should not, as in most military districts up to now, be handed over to hygienic, clinical or chemical laboratories depending on the kind of method which is to be employed. The necessary orders should be prepared with exact directions about technique and evaluation of the methods in order to avoid conspicuous differences between the different laboratories of the Armed Forces. Furthermore, the large number of methods, employed for the same purpose and of equivalent value, has to be reduced to a degree which satisfies the practical, clinical purposes rather than the scientific ones.

In particular, the following additional proposals are made to supplement the preceding suggestions:

1. Methods proposed are: macroscopic observation, cell count according to FUCHS and ROSENTHAL; cell-staining according to MAY-GIEMSA; estimate of the total protein through centrifugal methods such as the improved NISSLE method; two globulin reactions, to be exact, phase I reaction according to NONNE-APELT-SCHUMM as well as the sublimate reaction according to WEICH-BRODT; flocculation reactions such as the MEINICKE clarification test II, the KAHN and SACH-GEORGI test, complement fixation reaction; the mastic test with mastic-lumbo test as a standard mixture; determination of the quantity of sugar according to HAGEDORN and JENSEN; for bacteriological diagnosis the direct smear stained according to GRAM, with methyl violet according to ZIEL-NIELSEN and for bacteriological cultures chiefly the use of ascitic fluid, blood and endoagar culture mediums as well as grape-sugar bullion for enrichment.
2. With regard to methods concerning spinal fluid employed in hygienic laboratories, the following stipulations have to be made:



- a. In contrast to flocculation reactions, which have to be employed as standard methods in one laboratory in each military district, the complement fixation reaction ought to be made use of only in exceptional cases in a few testing stations, favored by transportation facilities and situated near the front, which might have to be chosen from one case to the other according to needs. The complement fixation reactions, necessary for the diagnosis of gonorrhea, tuberculosis, trichinosis, Weil's disease, echinococcus, etc. should be available at the same place.
- b. Quantitative estimates of sugar content could be performed as before, in chemical laboratories and
- c. the qualitative globulin reaction in the hospital immediately after the spinal puncture.

#### Discussion:

BLUMENBERG: Calls attention to the technically simple fuchsin-sublimate reaction according to TAKATA and ARA, valuable in differential diagnostic respects, which shows not only the amount of protein but shows even with certain limits also the type of protein bodies. For standardization of methods in laboratories, I make the proposal that the T.A.R. (TAKATA-ARA reaction) be used in place of the WEICH-BRODT test.

ZSCHUCKE: Under field conditions, the quantitative determination of protein according to NISSLE, will be hindered by the lack of an electrical centrifuge or sometimes through lack of electrical current. Very much more to be recommended under primitive conditions is the RHAQUI albuminometer by SICCARD and CANTALOUBLE which has given a good account of itself in Africa, a procedure which permits the reading off from a graduated tube after it has been left standing for 12 hours, the pro mill content of albumin precipitated by a chemical and physical process.

WAGNER: If clinics expect satisfactory results from serological tests in laboratories, they must keep in mind that spinal fluid must be delivered to the laboratories in condition permitting a satisfactory examination. Regrettably, this is frequently not the case inasmuch as spinal fluid samples, during the process of withdrawal and during further necessary handling, are much polluted by air and dust germs, especially through formations of earth-spores. This pollution impairs not only the bacteriological examination but through fermentive activity of saprophytes causes chemical changes of the fluids, e.g. with regard to protein and sugar. Therefore, clinics have to aim at obtaining spinal fluid under aseptic conditions and preservation in these conditions. Among the proposed examination methods, the normo-mastic reaction has proved its value for many years



and - in contrast to the gold reaction, is to be recommended as a comparatively simple one in technical respects. Every serologist is able to perform a mastic solution test. A separation of the analysis of the sugar content in spinal fluids and transfer of it to a chemical laboratory impairs the standardization of examinations and is unquestionably not necessary.

PANSE: Clinics are able to employ to full advantage the development of differential spinal fluid diagnoses only when results of examination are absolutely reliable, complete and comparable among themselves. Frequently it is not the case yet, standardization is necessary. Particulars about the type and numbers of reactions to be employed in every single case as well as directives for their proper employment are to be established and issued. To be examined are: appearance of fluid, number of cells (if possible in the hospital), reactions according to PANDY and NONNE, determination of the total protein, normo-mastic or gold-solution reactions (LANGE test), and finally tests for lues. Examination of protein relations is desirable. For the total protein test, mastic and gold-solution tests as well as for the protein relation, exact technical instructions are of particular necessity. I propose the issuance of a leaflet on this subject as a basis for senders and laboratories. The accompanying note, used for specimens submitted for examination, is not sufficient to cover particulars about spinal fluid. Representation of mastic and gold-solution tests should best be done in a diagram because the frequently employed representation in rows of figures is not elastic enough and besides, the basic schema, used as a foundation, does not vary. Exact comparisons are then not possible.

Directions for the standardization of cerebro-spinal fluid diagnosis.

- I. The diagnosis of fluid is incumbent on
  - a. clinicians
    1. for observing the macroscopic appearance
    2. for the count of cells,
    3. for the reaction according to PANDY;
  - b. hygienic laboratories (in addition to a possible bacteriological diagnosis)
    1. for a repeat-examination of the macroscopic appearance (xanthochromia, cobweb-coagulation, etc.),
    2. for the estimation of the total protein through centrifugal method,

3. for the mastic test with standard mixture of lumbo test and graphic evaluation

4. for the lues diagnosis according to directions given for this particular purpose

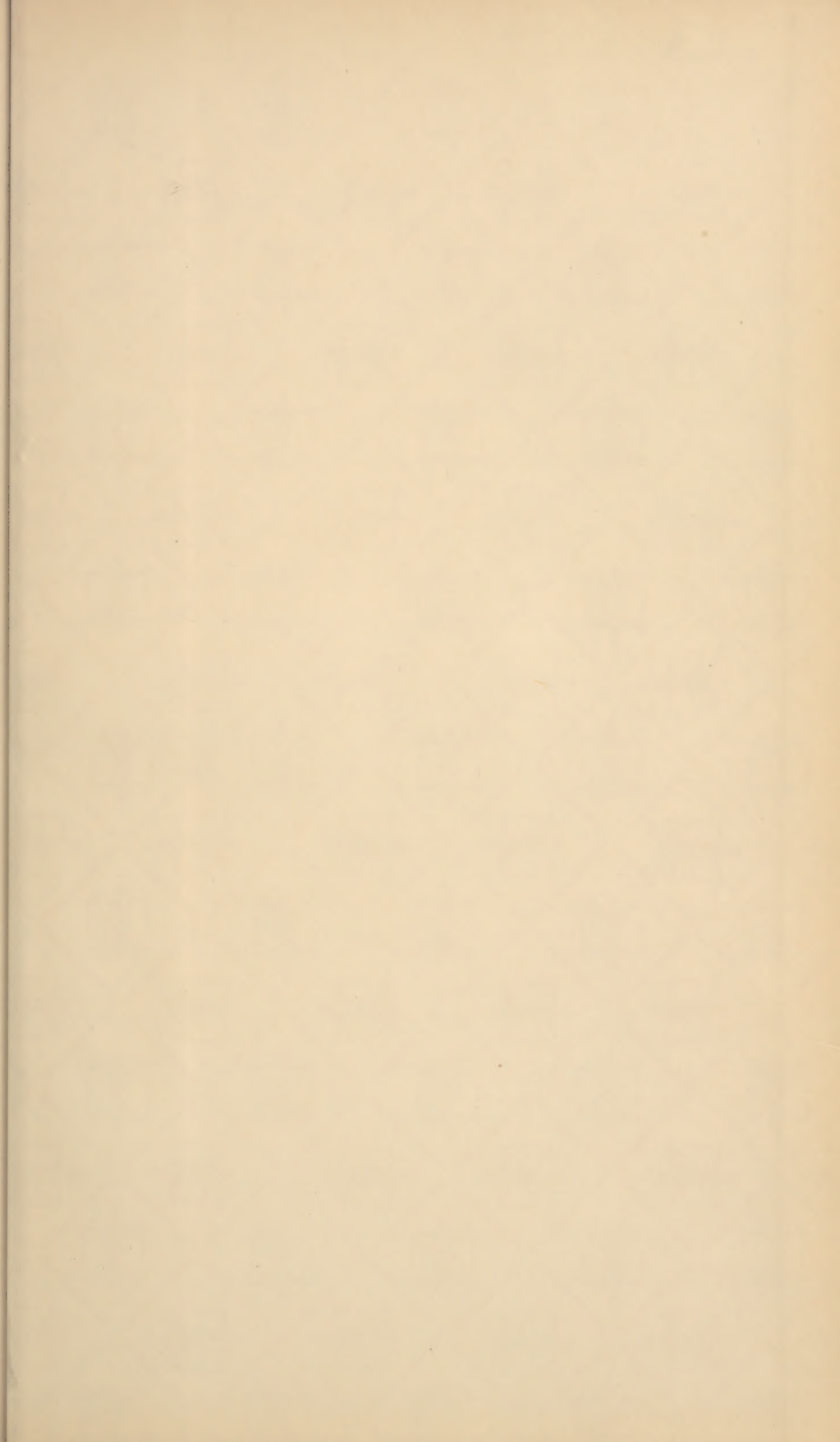
II. Results are to be put into a special pamphlet, containing also the exact clinical data, which has to be filled out by the clinicians to be forwarded to hygienists in order to supplement the accompanying note with regard to Ib above.



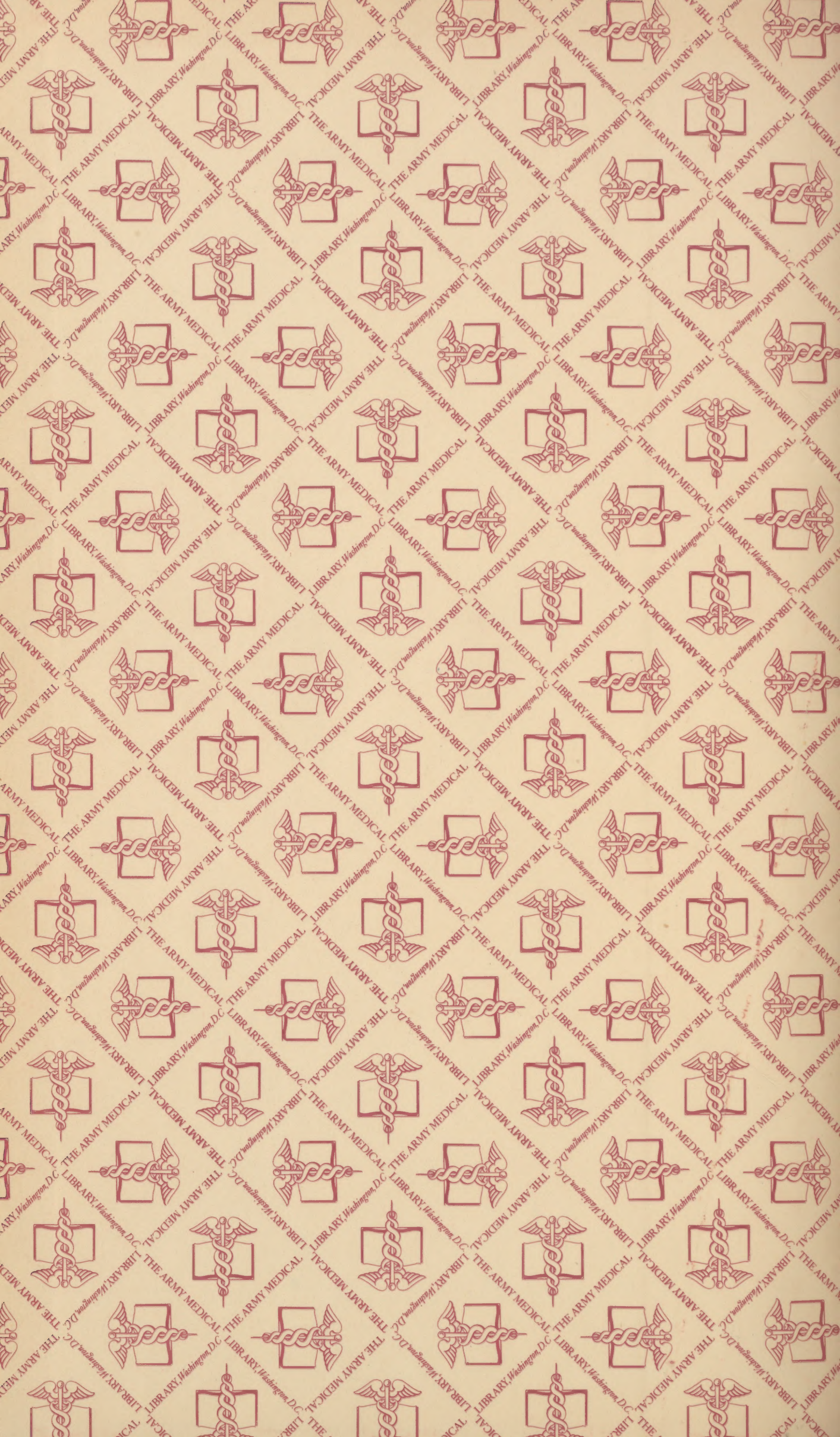




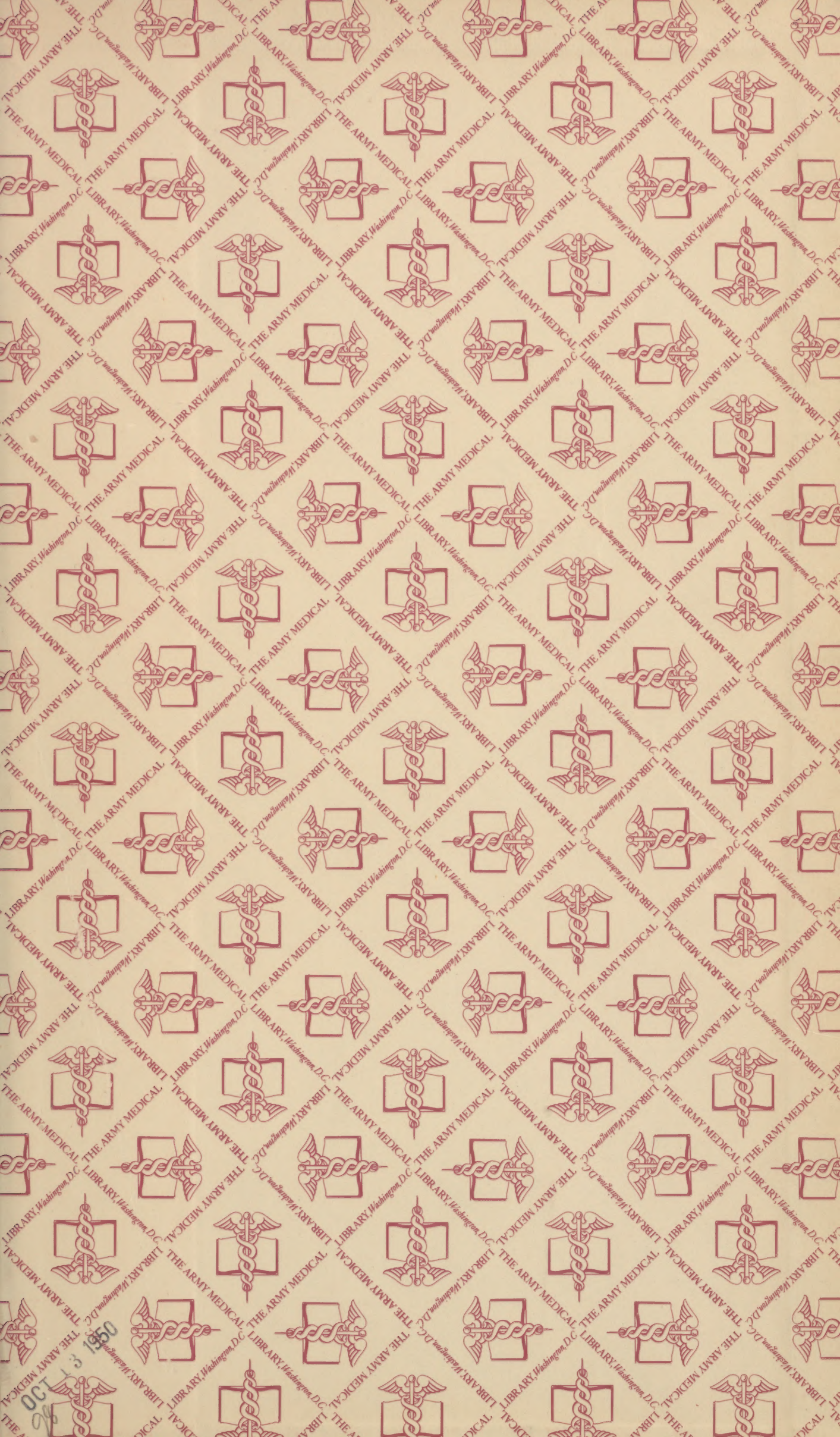














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